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**ANNUAL**  
**PROGRESS REPORT**  
**OF**  
**PUBLIC WORKS IN PUNJAB,**  
**FOR THE YEAR**  
**1870-71.**



**LAHORE:**  
**PUBLIC WORKS DEPARTMENT PRESS.**  
**1871.**



PROGRESS REPORT  
OF  
PUBLIC WORKS IN PUNJAB,  
FOR THE YEAR 1870-71.

PART I.—MILITARY.

The conversion of the buildings in the Palace Enclosure into quarters for the Officers and Troops of the Garrison was, during 1870-71, nearly completed. The only work that remained to be done was the alteration of one of the buildings into Regimental Workshops, and the provision of iron railings round the Officers' quarters. Delhi.

2. Further progress was made with the work of re-modelling the old barracks. In the Royal Artillery Lines, three blocks were completed, with the exception of doors and steps to two of them. In the British Cavalry Lines, the work on eight barracks was finished, and on a ninth nearly so. Umbala.

3. Two blocks of family barracks in the Royal Artillery Lines were completed. In the British Cavalry Lines, the half of one family barrack was constructed. In the British Infantry Lines, work on five family barracks was brought to completion, and two other barracks were in progress.

4. The Staff Sergeants' quarters in the British Infantry Lines were finished. The Sergeants' mess and library, in the same lines, were also completed.

5. The Gymnasium for the use of the Garrison of the cantonment was completed. The fitting up of the apparatus was in progress.

6. Several of the buildings in connection with the rest-houses for troops travelling by rail were brought to completion. The buildings finished were—a block of quarters for 88 men, with the necessary subsidiary buildings,—the quarters for families, with their out-offices,—the Officers' quarters and subsidiary buildings,—and the out-offices for the Commissariat Department. Another block of quarters for 88 men, with a privy, was in progress. The bungalow for the Superintendent of the Rest-house was finished. A platform for the railway siding from the Umbala cantonment station to the rest-houses was being constructed.

**Umbala.**

7. The experimental Artesian boring at *Umbala* for the supply of water in the cantonment was taken down to a depth of 455 feet. The work had to be suspended owing to a fracture in the pipes. Wrought-iron piping had to be sent for from England.

**Dugahai.**

8. Good progress was made with the three full-company barracks. No. 1 barrack was being roofed in. The upper storey of No. 2 barrack was in progress, and the superstructure of the lower floor in barrack No. 3. A site was prepared for two more full-company barracks.

9. Of the barracks for families, a block of quarters for 28 families was completed. Latrines for these families were also finished. Another block of quarters for eight families, commenced in the previous year, was completed. Lightning conductors were provided to all the barracks for families.

10. A temporary workshop was built, and a browning-room added to the Armourers' shop. Water-tanks were provided for the family barracks.

**Solon.**

11. A shed for the storage of barrack furniture was built at *Solon*.

**Kussowlie.**

12. The block of quarters for 18 families on the old quarter-guard site was completed, and made over for occupation. A latrine for these quarters was also completed.

13. Another block of quarters for 18 families on the "lower site" was finished, and made over to the Barrack Department. The block of quarters for 24 families made considerable progress. The plastering of half the building remained to be done. The other half was made over and occupied by families.

14. Lightning conductors were provided to all the completed barracks for single men and families.

15. A cook-house for single men was completed during the year. Some small expenditure was incurred on a canteen; but the work was suspended pending a reconsideration of the question of site.

16. Fire-ladders and water-tanks were supplied to barracks Nos. 7 and 8, and wash-houses for these barracks were also built. A second tank was provided for drinking water.

17. The premise of the Upper India Commercial Association was converted into a mess-house for Officers.

18. Quarters were built for the Purveyor attached to the hospital.

19. The direction of the cart-road running through the cantonment was altered so as not to interfere with the parade-ground and buildings. Kussowlie.

20. Railings were provided to dangerous parts of the road near the family barracks, and trees were planted in various parts of the cantonment.

21. The double-storeyed barrack for 32 families was completed during the year and occupied. A latrine for these families was also completed. Subathoo.

22. The new hospital for British Infantry made good progress. The masonry of the building was completed, and the roofing was well in hand.

23. The Powder Magazine commenced in the previous year was completed.

24. The removal of portion of the bazaar was in hand, and three-fourths of the work completed. A question of the amount of compensation, under consideration of the Civil Authorities, placed the work in abeyance.

25. Quarters were commenced for the Warrant Officers. The foundations of the building were put in, and part of the superstructure completed. Jutög.

26. Lightning conductors were provided to the several buildings requiring them.

27. Considerable progress was made with the construction of the barracks for head-quarters and eight companies of a British Infantry Regiment. No. 6 barrack was completed, and little remained to be done to barracks Nos. 4 and 7. The plinths of barracks Nos. 10 and 11 were in progress. Julundur.

28. The superstructure of the main guard and cells, in these lines, was well in hand, and the lavatories for the new barracks were quite finished.

29. The defects on the main drainage of the suddur bazaar were remedied, and the system of drains completed.

30. The Cattle Gomashta's house was added to, and converted to provide quarters and out-offices for the Bakery Sergeant.

31. Wooden covers were supplied to certain wells in the cantonment.

32. Of the five barracks in progress for single men of the Depôt at *Baloon*, Nos. 1, 2, and 4 were nearly completed. No. 1 was occupied by troops; but the iron railings and conductors remained to be furnished. In Nos. 2 and 4 barracks, Dalhousie.

## Dalhousie.

the iron fittings and ceiling remained, and the white-washing. The superstructure of No. 3 barrack was raised to a height of 14 feet above ground-level, and that of No. 5 barrack was well advanced.

33. A cook-house, wash-house, and privy, for No. 1 barrack, were completed, and a cook-house and wash-house for barrack No. 2. Double privies were constructed for barracks Nos. 1, 2, 4 and 5.

34. The work of erecting boundary pillars round the cantonment of *Baloon* was in progress.

35. The superstructure of an hospital for the Goorkha Regiment at *Bukloh* was completed.

## Sealkote.

36. Fire-places were provided in the wards of the hospital for British Troops, and temporary sheds erected for the hospital servants attached to the Royal Artillery.

37. On account of the pressure for stable accommodation, temporary stables were commenced for the Waler horses of the British Cavalry. One-fourth of the work was done by the end of the year.

38. The new bakery for the Commissariat Department was finished.

## Umritsur.

39. The upper storey of two gateways in Fort *Govind-gurh* were dismantled at the request of the Military Authorities.

## Lahore.

40. The ground in the immediate vicinity of the hospital in Fort *Lahore* was levelled and turfed. A lock hospital was built at *Anarkullee*.

## Meean Meer.

41. A building was purchased at *Meean Meer*, which it is intended to convert so as to suit it for the purposes of a Medical Depôt, the Depôt at Sealkote being about to be transferred to *Meean Meer*.

42. Quarters were constructed for the Native Doctors in both the Native Infantry Lines and in the Native Cavalry Lines.

43. The new bakery for the Commissariat Department was completed. Also sheds for elephants in the Commissariat cattle-yard. A large store-room in the yard was also constructed.

44. A new slaughter-yard was begun and finished during the year.

45. Pillars, with tablets affixed, were erected in various parts of the cantonment to indicate the names of the principal streets and roads.

46. The planting and watering of trees in the cantonment was extended and continued.



47. A boarded floor was supplied to the laboratory in the Arsenal, and alterations were effected in the lightning conductors to the Powder Magazine. Some of the arches in the Arsenal Workshop had to be strengthened. Ferozepoor.

48. The blocks of quarters for 105 families in the British Infantry Lines were nearly brought to completion. Eight blocks have been finished, and are occupied, of which two were finished during the year. Considerable progress, also, was made with the ninth block. Two experimental cook-houses for these family quarters were completed.

49. The double-storeyed hospital in the British Infantry Lines made some progress ; but work had to be suspended during the year for want of funds. The masonry superstructure of the first floor was finished, and some portion of the second floor. The hospital for females, in the same lines, was nearly completed. Quarters for the Purveyor attached to the hospital were provided.

50. In the new Royal Artillery Lines, work on the three wash-houses, commenced in the previous year, was brought to completion. A Magazine was built for the Field Battery. Two temporary latrines for single men, in these lines, were constructed, and also a gun-shed, a horse hospital, and a temporary shoeing-shed.

51. Stabling was completed in the new Artillery Lines for 114 horses, and huts for the necessary complement of syces.

52. In the Native Infantry Lines, quarters were provided for two Native Doctors and two Medical Pupils attached to the hospital.

53. Trees were planted in the British Infantry and Artillery Lines, and kept watered during the year. Wooden covers were provided to all wells supplying drinking water to the cantonment.

54. The end rooms of Nos. 1, 2, and 3 barracks, and some domed buildings in the old Fort were converted into quarters for families of the British Infantry Regiment recently arrived. Mooltan.

55. As a supplement to the above, one of the buildings vacated by the Ordnance Department in the Fort was converted into a school-room, with quarters for the School Master.

56. Parapet walls and drip cornices were provided to such of the buildings as required them in the British Infantry and Artillery Lines. New covered passages were constructed from the family barracks to the cook-rooms attached. Two wells were dug in the Royal Artillery bazaar and hospital compound.

**Mooltan.**

57. A new Magazine was built for the Native Cavalry ; the quarter-guard in the Native Cavalry Lines was enlarged.

58. The metalling of the cantonment road from the Government Telegraph Office to the *Shere Shah* road was in progress.

59. The existing plantations of trees in the *Mooltan* Cantonment were maintained, and new trees planted.

**Derajat.**

60. The work of renewing the roofs and raising the walls of the 3rd Punjab Native Infantry Lines at *Dera Ismael Khan* was in progress. Work on three double and two single barracks remained to be done.

61. Spurs were thrown out in the River Indus, near *Dera Ismael Khan*, to protect the cantonment from the encroachments of the river, and were successful.

62. The additions to the outpost at *Touzianee* were completed. The well at the outpost of *Boom-ki-Thool* was finished.

63. A new Fortified Post was constructed at *Kot Khir-gee*, to be garrisoned by the Frontier Militia. A well opposite the *Girnee* Pass was commenced ; but work was stopped shortly after commencement.

64. The well-water at *Subzil-ka-Kote* being brackish and unwholesome, it was determined to select *Subzil-ka-Kote* for the first trial of an Artesian boring on the *Derajat* Frontier. On arrival of the tubes, Mr. Harrop, Mechanical Engineer, was deputed to supervise the operations. The bore was commenced at the bottom of a dry well 200 feet deep, and a large supply of good water was reached at a depth of 415 feet for the surface of the ground. The water at once rose in the tube 190 feet.

65. Wooden covers were supplied to wells yielding drinking water in the several cantonments in the *Derajat*.

**Tullagung.**

66. The temporary hospital for Native Infantry stationed at *Tullagung* was completed. The quarter-guard and bells-of-arms for the same Regiment were nearly finished.

67. Work on the three wells for the cantonment was brought to completion.

**Jhelum.**

68. Bells-of-arms and solitary cells for the Native Regiment stationed at *Jhelum* were commenced.

**Rawul Pindee.**

69. In the Fortified Enclosure No. 1 barrack was completed. The superstructure of the lower floor of barrack No. 2 was finished ; and in the upper storey the walls of four main rooms and Sergeant's quarters were well advanced. The wood-work for the building was well in hand.

70. Progress was made with the completion of accommodation for the British Troops. The Regimental store-room in the Fort Lines was completed, and made over for occupation. The voluntary workshops, in these lines, were completed excepting a part of the ridge tiling. Of the gun-sheds for two Batteries of Royal Artillery, the superstructure was completed up to roof-level, and the wood-work for the roof was in hand. Rawul Pindee.

71. The stables for the Horse Artillery were completed, and made over to the Military Authorities. Of the stables required for the Light Field Battery, the work on two Sub-divisions was well advanced. Some new huts were built for the accommodation of the syces.

72. The buildings in connection with the Gas Works were completed, including the workshop, store-room, and a bungalow, with out-offices for the Gas Engineer. The mains were laid from the site of the Gas Works to the governor house, and from thence to the barracks in the Church and Artillery Lines, and the lighting of the barracks with gas was commenced.

73. The party of six Sepoys of the Sappers and Miners, employed on the operations for boring and collection of petroleum in the district, was engaged in boring at *Futteh-jung*, where there were prospects of obtaining oil. Several bores were sunk, of which one to a depth of 80 feet tapped the oil. The yield from this bore was not very large; but the supply could not be properly tested for want of proper storage room. 2982 gallons of the oil were obtained, of which 2500 were sent to *Rawul Pindee*, the remainder being in store at site. Mr. B. S. Lyman, the Mining Engineer, deputed to Punjab by the Government of India, was engaged during the year on an examination of the known and probable sources of petroleum in the country about Rawul Pindee and the Salt Range, and a report of his investigations was submitted for the information of the Government of India with this office No. 955 dated 23rd February 1871.

74. In the Native Cavalry Lines at *Rawul Pindee*, the hospital was completed, with the necessary range of out-offices.

75. A quarter-guard in the Native Infantry Lines was constructed, and made over for occupation.

76. The barrack for single men on the site known as the "Woodcot site" was nearly completed. Murree.

77. Wash-houses for barracks Nos. 5, 7, and 8 were completed, and made over to the Military Authorities. Work was commenced on a wash-house for barrack No. 9.

**Murrea.**

78. Good progress was made with the provision of subsidiary buildings (cook-rooms, latrines, urinaries, &c.) for the barracks for single men.

79. Flagged floors were provided to the back rooms of the quarters for families.

80. Houses were constructed for the accommodation of the servants attached to the hospital.

81. The work of providing fire-tanks for the Depot barracks was in progress. The road between Nos. 6 and 8 barracks was widened out and improved.

82. A ration-stand and dead-house were constructed near the family barracks at *Cliffden*.

**Huzara.**

83. The extension of the Goorkha Lines at *Abbottabad* was in hand. The foundations of a family barrack were put in, and the required alteration of two of the old barracks was carried out. Materials were collected for re-roofing the huts for Soldiers at *Khyragully* and *Changlagully*.

84. The provision of accommodation for the Military guard in Fort *Hurreepoor* was completed, and the outer defences of the Fort were renewed.

**Attok.**

85. The quarters for Warrant Officers, with out-offices, in the Fort at *Attok*, were completed. Masonry gun platforms were provided in the "Clyde Battery" in the Fort.

**Kohat.**

86. The new lines for a Regiment of Native Infantry at *Kohat* were in progress. Five half-company barracks were completed, and made over to the Military Authorities.

87. Materials were collected for the project for new water-supply at *Kohat*.

**Edwardesabad.**

88. The new hospital for Cavalry at *Edwardesabad* was completed, and handed over to the Military Authorities.

**Mahomedzai.**

89. The new Fortified Post at *Mahomedzai* was enlarged, and the work completed.

**Adhummie.**

90. The collection of materials for a new Post at *Adhummie* was commenced; but work was suspended pending a decision in regard to a question raised regarding the site.

**Nowshera.**

91. A quarter-guard for the Native Infantry at *Nowshera* was begun and finished during the year. Also, bells-of-arms in the same lines. A quarter-guard for the Native Cavalry was also constructed.

**Peshawur.**

92. At *Peshawur*, the work on four blocks of Officers' quarters with out-offices in the new Fort Enclosure was brought to completion.

## PART II.—CIVIL WORKS.

## BUILDINGS.

*Revenue.*

93. A Tehseel at *Dubwalee* was nearly completed. Sirsa District.
94. A house was provided at *Kooloo* to serve as a Kucherry for the Assistant Commissioner. Several Minor Civil Works were executed at *Julundur*. Kangra District.
95. The new Kucherry for the Deputy Commissioner at *Lahore* was completed. The building provides in a compact form, and under a handsome exterior, accommodation for the Deputy Commissioner's Court, the Subordinate Courts, the Treasury and Currency Offices. The unsightly buildings erected as a temporary measure for troops at the first occupation of *Lahore*, and which have hitherto been occupied by the Civil Courts, have in great part been cleared away to allow space for the new Kucherry. Lahore District.
96. A combined Tehseel and Thana at *Depalpoor*, with rest-house for Civil Officer, was completed. Montgomery District.
97. A new Abkaree was built at *Ferozepoor* from municipal funds. Ferozepoor District.
98. A room was added to the Commissioner's Kucherry at *Rawul Pindee*, and the Court-room enlarged. The Assistant Commissioner's Kucherry at *Murree* was also enlarged and improved. Rawul Pindee District.
99. The Tehseel and Thana at *Hurreepoor* was nearly completed. The building would have been finished but for a temporary insufficiency of supervising staff. Huzara District.

*Post Offices.*

100. The combined Post and Telegraph Office at *Abbotabad* was completed, and made over for occupation. This was the only Postal work of any importance in hand during the year. *Post Offices.* Huzara District.

*General.*

101. At *Delhi*, a poor-house was built, out of Local funds, to accommodate about 30 or 40 persons of all sects. *General.* Delhi.
102. In the building at *Lahore*, occupied by the several offices of the Public Works Department, additions and alterations were made to provide increased accommodation for the offices of the Chief Engineer Irrigation Works, and of the Controller Public Works Accounts, Punjab. Public Works Offices, Lahore.

**BUILDINGS.***General.*

Lunatic Asylum,  
Lahore.

103. The water-supply of the lunatic asylum at *Lahore* having been considered to be defective, and the probable cause of disease, a tank to hold one month's supply of filtered water from the canal was provided for the use of the inmates of the asylum.

Lock Hospital, Ferozepoor.

104. A lock hospital was built, from Local funds, in the town of *Ferozepoor*, near the dispensary buildings.

Museum, Peshawur.

105. The portion used as a Museum of the building known as the Residency at *Peshawur* was improved.

Dispensaries.

106. Considerable additions and improvements were made to dispensaries. The dispensaries at *Sirsa* and *Fazilka* were improved. New branch dispensaries were in course of construction at *Ajnala* and *Turun Tarun*, in the Umritsur District. An extra barrack was built for the blind in the *Umritsur* poor-house. New female wards were provided at *Ferozepoor*, and new out-offices to the dispensaries at *Goojramwala* and *Wuzeerabad*. Improvements were effected to the dispensaries at *Mooltan*, *Mozuffurgurh*, *Shahpoor*, and *Sheikhbooddeen*, in *Bunnoo*. The main building of a new dispensary at *Hussun Abdal*, in the Rawul Pindee District, was completed, and additions were made to the leper asylum at *Rawul Pindee*. New dispensaries were in progress at *Pak Puttun*, in the Montgomery District, at *Pind Dadun Khan*, in the Jhelum District, and at *Teree* and *Hungoo*, in the Kohat District. The cost of all these dispensaries, &c., was met from Local funds.

*Ecclesiastical.*

*Ecclesiastical.*

107. An ornamental wall and gate were provided for the Church compound at *Kussowlie*. A new cemetery was provided at *Subathoo*.

108. The enclosure wall of the cemetery at *Dalhousie* was nearly finished.

109. The cemetery at *Murree* was enlarged by the addition of a fourth terrace.

110. An enclosure wall was built on one side of the Church compound at *Murree*.

*Educational.*

*Educational.*

111. The new block of out-offices for 24 servants, and new closets for the Lawrence Asylum buildings at *Sunawur*, were completed.

112. Two large store-rooms were provided for the Book Depôt attached to the office of the Director of Public Instruction at *Lahore*. The construction of the Medical School Hospital at *Lahore*, an imposing structure situated between the City and Anarkullee, was pushed forward vigorously during the

year, and the building completed with the necessary out-offices. Its cost has been nearly  $1\frac{1}{2}$  lakhs, of which Rs. 50,000 were granted as a contribution from Imperial funds, the balance being met from Local funds.

113. Local funds have also contributed largely towards the construction of school-houses in districts. School buildings, from this source, were in progress at *Nujuffgurh* and *Faridabad*, in the Delhi District. At *Palumpoor*, in Kangra, a house was built for out-station scholars. Two village schools were constructed in the *Goordaspoor* District, and additions and improvements were effected to the school buildings at several places in the *Ferozepoor* District, and at *Mozuffurgurh* and *Khairpoor*, in the Mozuffurgurh District. The town schools at *Attok* and *Huzroh* were completed, and a school-house was in progress at *Nowshera*.

#### Judicial.

114. A large Police station was built at *Ubohur*, in the Sirsa District, and accommodation was provided from municipal funds for the Municipal Police at the town gates in *Sirsa*, *Fazilka*, and *Raneea*.

115. A new Police out-post and rest-house were in progress from municipal funds at *Khurkowa*, in the Rohtuk District, and a Police barrack was constructed at *Bahadurgurh*, in the same District.

116. The new workshops in the Jail at *Delhi* were completed. Two Police station houses were built by the *Delhi Municipality*.

117. Barracks for 80 men of the Imperial Police were completed at *Loodiana*.

118. A Police station was built from Local funds at *Permanund*, in the Goordaspoor District.

119. Barracks were built for the Police at *Sealkote*.

120. Wards outside the Central Jail at *Lahore* were built for European prisoners under trial, and for debtors. Solitary cells for 100 prisoners in the Central Jail were nearly completed, and two pucca wells of drinking water provided in the enclosure.

121. A new station house for the Municipal Police was erected at *Ferozepoor*.

122. The large new Jail at *Montgomery* made good progress during the year. The outer enclosure wall, workshops, &c., were completed, and the hospital and watch-tower were in progress. Prison labor was largely employed on the work.

123. The large gateway and offices for the Jail at *Mooltan* were very nearly finished.

#### BUILDINGS.

##### Educational.

##### Judicial.

**BUILDINGS.****Judicial.**

124. A new Thana at *Mahbul*, in the Derajat, was completed.

125. Improvements were effected from Local funds to several of the circuit-houses in the *Jhelum* District.

126. It was in contemplation to provide solitary cells for 40 prisoners in the Jail at *Rawul Pindie*, and provision for the work was included in the Budget of the year. The item was at first disallowed by the Government of India, but was afterwards admitted ; and when work was about to be commenced, a contagious fever broke out in the Jail, which necessitated its being deferred.

127. The new Thana at *Khanpoor*, in Huzara, progressed but slowly, owing to want of sufficient supervising staff. The building was, however, nearly completed.

128. The Tehseel and Thana at *Lukkee*, in Kohat, was in progress ; but the work was much impeded by the heavy rain.

129. The large combined Tehseel and Thana at *Murda*n was completed. The Thana at *Roostum* was also finished.

130. In the Jail at *Peshawur*, two new workshops were built, and iron railings were obtained from the *Madhopoor* Workshops for erection in the Jail enclosure.

131. Quarters for Municipal Police were constructed in the city of *Peshawur*.

**COMMUNICATIONS.****COMMUNICATIONS.*****Metalled Roads.*****Delhi District.**

132. The work on completion of the Punjab portion of the *Delhi* and *Muttra* road was not pushed forward as vigorously as could have been done, owing to insufficiency of funds. Ten stone bridges up to mile No. 8 have been completed. On one section of the road, however, between *Nizamooddeen* and *Julana-ke-Serai*, near the junction of the proposed road to *Okla*, very fair progress was made, and the whole section has been metalled.

133. The collection of metal for the *Delhi* and *Bahadorgurh* road was in hand.

**Delhi to Umbala and  
Lahore.**

134. The line of trunk road from *Delhi* to *Lahore* was kept in repair, including its bridges and road chowkees. A diversion of the road near the Railway bridge across the *Sutlej*, much wanted for convenience of traffic, was nearly completed, and the *Beas* diversion road was metalled.



135. The road from *Umbala* to *Jugadree*, en route to *Saharunpoor*, was completed, with the exception of some necessary flood openings in the 33rd and 34th miles.

COMMUNICATIONS.

Umbala to Jugadree.

136. The metalling of the road across a dry portion of bed of the *Sutlej* river near *Ferozepoor* was taken in hand, and all but finished. The traffic on this road in grain, &c., between the *Ferozepoor* District and *Lahore*, is considerable, and the metalling of this section will be productive of considerable benefit.

Ferozepoor.

137. The metalling of the road from *Mooltan* to *Shere Shah*, paid from Local funds, was commenced.

Mooltan District.

138. The trunk road from *Lahore* to *Peshawur*, with its bridges, road bungalows, &c., was maintained in tolerably good order; but the section of the road from *Lahore* to *Jhelum* deteriorated considerably, owing, to some extent, to insufficiency of the funds it was found possible to provide for its maintenance.

Lahore to Peshawur.

#### *Unmetalled Roads.*

139. The *Kalka* and *Simla* road has not progressed satisfactorily from insufficiency of funds, and from which cause several sections had to be left unprotected by railings or parapets. The *Baoli* bridge, of 25 feet span, with iron girders, was finished. Work on the *Tara Davee cliff*, and the *Jabli* and *Kalka* bridges, were in progress, but had to be suspended for want of funds.

Kalka to Simla.

140. The road was maintained in good order; but in August four bridges of spans varying from 15 feet to 50 feet were carried away by heavy floods, and the state of the available funds did not admit of their being renewed.

Hindustan to Tibet.

141. This work, which is being executed from Local funds, has made but moderate progress from want of funds. On the *Noorpoor* and *Bunderghat* section a mule track was completed, thus utilizing a large portion of finished mileage between *Noorpoor* and *Kotelah*. The cart-road from *Kangra* to *Palumpoor* may be considered as practically open. The first cart arrived at *Palumpoor* during the Fair of that year, and the Executive Engineer reports that since these carts have been plying steadily and almost daily over the road as far as *Palumpoor*.

Kangra Valley  
Roads.

- COMMUNICATIONS.**
- Dunera to Baloon.** 142. Of the new mule road from *Dunera to Baloon*, four miles were drained and bridged, and completed in all respects. The earth-work for 10 miles was roughed out.
- Lahore to Shekopoora.** 143. The work on the road from *Lahore to Shekopoora* was vigorously pushed forward, and a number of bridges and flood openings constructed. Two timber-bridges, and several masonry drain bridges, were finished, and the road was opened out for traffic. On the section beyond *Shekopoora* leading to the *Derajat*, three masonry drain bridges were completed.
- Sealkote to Goordaspoor.** 144. The construction of the *Sealkote and Goordaspoor* road was also well advanced, and several drain bridges on it completed.
- Derajat.** 145. Of the raised embanked road from *Dera Ismael Khan to Tibbee*, on the way to *Dera Gaze Khan*, 18 miles were opened for traffic.
- Rawul Pindee to Murree.** 146. Parapet walls or stout wooden railings, where remaining to be provided, were supplied at all dangerous places on the road from *Rawul Pindee to Murree*.
- Abbottabad to Murree.** 147. Work on this road was continued by a European Military Working Party till the sections which were at a sufficient elevation to allow of European labor being employed were completed. Parties of the 23rd Punjab Pioneers worked on the lower sections of the road, and towards the close of the year coolie labor was also employed. About three miles of the road only were left to be completed at the end of the year.
- Peshawur.** 148. The improvement of four miles of the road over the *Soordag* Pass, on the new line of road from *Peshawur to Kohat*, *via* the *Meer Kulan* Pass, was in progress.
- District Roads.*
- Goorgaon.** 149. Considerable progress was made in the road from *Goorgaon to Noh*, the earth-work of which is nearly complete up to *Sonah*; and improvements were effected to two other roads in the *Goorgaon* District, and mile-stones were erected along some of the district roads.
- Delhi to Goorgaon.** 150. The road from *Delhi to Goorgaon*, *via* *Kootub*, was improved by raising a low portion and constructing two bridges.

151. Syphon-drains of iron-piping, 6" diameter, were laid under some village roads in the *Delhi* District,  $1\frac{1}{2}$  feet below the surface, to admit of the fields being irrigated across; the masonry reservoir at each end of the syphons was built by the Zemindars. They have been proved sufficiently strong for the passage of loaded carts over them. COMMUNICATIONS.  
Delhi District.
152. Small bridges and culverts were made on the main road passing through the *Hissar* District, and on district roads of *Rohtuk* and *Sirsa*. Hissar, Rohtuk,  
Sirsa.
153. In the *Umbala* District, some improvements were made to the *Dadoopoor* road, and small bridges were constructed on the *Chumkour* and *Jugadree* roads. Umbala.
154. One-fourth of an unmetalled road from the *Julundur* Railway Station to the *Kuppoorthulla* boundary was completed in British territory, to meet the road made by the *Kuppoorthulla* Authorities on their side. Julundur.
155. In the *Hoshiarpoor* District, seven miles of hill roads were constructed—one of the roads, from *Mungurwal* to *Nungul*, being in continuation of work of previous year; and the road from *Meerthul* to *Tanda* was bridged in two places. Hoshiarpoor.
156. Progress was continued on the road from *Kangra* and *Kooloo* through *Lahoul* towards the *Ladakh* Frontier; at the close of the year, about 46 miles of the *Bara Lacha* road were completed, and about two-thirds of the new line at the *Bohtang* Pass, and about 20 miles of road remained to complete, which will probably be executed in the current year. Timber was felled for the new bridge over the *Chandra* at *Koksar*; but the project has been suspended on the recommendation of the local authorities and others. A bridge, much needed, was built near *Baijnath*, on the *Kooloo* and *Palumpoor* road; and bridges were newly built or renewed on some other district roads of the *Kangra* District. Kooloo to Lahoul.
157. Three bridges, much required to keep open the communication between *Sealkote* and the *Goordaspoor* Districts, were completed on the road leading from *Goordaspoor* to the *Trimmoo* ferry. The bridge over the *Kirrun* Nuddee, on the road from *Kalanour* to *Dera Nanuk*, was enlarged with three additional arches, the waterway having proved insufficient; and two smaller bridges were built on the same road. A bridge or viaduct was built over a swamp near *Buttala*, to Sealkote.

## COMMUNICATIONS.

Sealkote.

connect this town with the main road and the public buildings on it; the townspeople subscribed a large sum towards the cost. Eleven small bridges were built on various roads, and at *Puthankote* to connect the new encamping ground with the main road.

158. In the *Sealkote* District, the *Sealkote* and *Chuprar* road was bridged in four places; the road to *Jummoo*, in three places, with three metalled gaps; materials were collected for a bridge over the *Booddee* Nullah, on the direct road from *Sealkote* to *Lahore* *viâ* *Dodag*, which will be completed in 1871-72; and metalled gaps were made on the road from the Cantonment to the *Koolowal* ferry. Land was taken up and paid for, for the section between *Zuffurwal* and *Droogree*, of the *Sealkote* and *Goordaspoor* road.

## Ferozepoor.

159. At *Ferozepoor*, the road connecting the Delhi gate of the town with the Grand Trunk Road was improved and remetalled; and the local authorities report a considerable increase of traffic along it.

## Montgomery.

160. In the *Montgomery* District, a provision for improving the Railway feeder between *Cheechawutnee* and *Jhung* lapsed, owing, it is reported, to modifications in the sanctioned estimate. It is hoped that the work will be completed in 1871-72.

## Jhung.

161. In the *Jhung* District, a larger expenditure is shown in raising and improving the *Jhung* and *Kamalia* Railway feeder, but the progress is not reported.

## Mooltan.

162. The road from *Mooltan* to the *Rungpoor* ferry was improved. Several provisions for roads in the *Mooltan* District lapsed, or had to be transferred to other works.

## Mozuffurgurh.

163. Materials were collected for a bridge over the *Sirdarwah* Canal, on the *Koreishee* and *Keenjah* road, and smaller bridges were constructed on roads in the *Mozuffurgurh* District leading to *Rungpoor*, *Alipoor*, and *Khangurh*.

## Derajat.

164. Bridges and syphon-drains were constructed on the road from *Dera Gaze Khan* to *Mithunkote*, in continuation of work of former years; five bridges were built on the district road from *Dera Gaze Khan* to *Dera Ismael Khan*, and the same number of bridges on the *Sheroo* road; and two miles of road from *Dera Gaze Khan* to the *Koreishee* ferry on the *Indus* were metalled.

165. Some metalled gaps were constructed on roads leading to Railway Stations, and ordinary district roads, in the *Goojranwala* District ; a mile of the road from *Goojranwala* to *Sealkote* was metalled ; and mile-posts were erected along some of the district roads.

COMMUNICATIONS.  
*Goojranwala.*

166. The road from *Jalalpoor*, in *Goojrat* District, to the *Koolowal* ferry, was raised, for the convenience of traffic with *Sealkote* and of travellers to *Cashmere*. The metalling could not be completed for want of carriage for kunkur owing to the Railway operations. A metalled gap was made on the road from *Goojrat* to *Jalalpoor*.

*Goojrat.*

167. Considerable progress was made in reconstructing and bridging the *Dhurreala* section of the road from *Jhelum* to *Pind Dadun Khan*, and a little over 8 miles out of 11 were completed : the remainder it is hoped to complete in 1871-72.

*Jhelum.*

168. In the *Shahpoor* District, the 106 cross drains on the *Oochalee* and *Sukesur* road, in the Salt Range, were completed ; the bridge on the *Sodhi* and *Kutwai* road was also completed ; a part of the main road from *Jhelum* to *Mooltan* was raised and bridged ; and a bridge was built over low ground between *Shahpoor* and *Khooshab*, on the main road to *Dera Ismael Khan*, and another on the road from *Pind Dadun Khan* to *Goojrat*.

*Shahpoor.*

169. In the *Bunnoo* District, some progress was made in raising, widening, and bridging village cross roads ; a bridge over the *Kutch Kote* stream, near the Cantonment of *Edwardsabad*, was all but completed ; and the *Meereean* and *Esa Kheyl* roads bridged, the surrounding villages having supplied Sissoo wood timbers, free of cost, for the former.

*Bunnoo.*

170. A portion of the *Daoodzai* road was metalled in the vicinity of *Peshawur* ; a mile of the road leading from the Grand Trunk Road to the site of the *Peshawur* Fair was metalled, up to the *Shaikh* Canal ; an unmetalled road was made and bridged, leading from the Grand Trunk Road to the *Shahi Bagh* ; portions of the *Doaba* road were improved ; a bridge near *Dilazak*, on the *Nissutta* road, was enlarged ; and smaller bridges were built over other district roads of *Peshawur* District.

*Peshawur.*

*Bridges.*

- COMMUNICATIONS.**  
**Umbala to Jugadree.** 171. The bridge over the *Western Jumna Canal*, on the *Umbala and Jugadree Road*, made good progress. And some wooden bridges over the overflow of the *Chittung* were commenced.
- Markunda Bridge.** 172. All that it was considered necessary to do with a view to strengthen the bunds which guide the flood waters to the bridge was completed.
- Umbala and Kalka Road.** 173. The renewal of the arches of certain bridges on the 5th, 9th, and 23rd miles of the *Umbala and Kalka Road* were completed. A bridge on the 5th mile was constructed, and another in the 6th mile nearly finished.
- Trunk Road between Julundur and Umritsur.** 174. The masonry bridge over the *West Beyn* river was nearly finished.
- Kangra Valley Road.** 175. The *Sumoolah* bridge, on the *Bunderghat* and *Bajinath* section, had its parapets finished. The *Boneyr* bridge, one of the most important engineering projects on this line of road, was nearly completed. The *Durroon* concrete bridge, of 48 feet span, was completed. It has proved an important success. The *Kholee* bridge on this section also made good progress.
176. On the *Bunderghat* and *Noorpoor* section, the *Dehree* bridge was well advanced, and the *Triloknath* bridge completed. The *Bhallee* bridge, 60 feet span, on this section, was also nearly finished.
- Rawul Pindee.** 177. The masonry bridge over the *Leh* nullah, on the road from the *Suddur Bazaar* to the City, executed from Local and Municipal funds, was completed and opened for traffic.
- Rawul Pindee and Murree Road.** 178. On the hill portion of the road to *Murree*, the substitution of masonry bridges for the former temporary wooden ones was in progress.
- Murree and Cashmere Road.** 179. The construction of the iron suspension bridge over *Jhelum* at *Kohala*, connecting the territory of His Highness the Maharajah of Cashmere with the British District of Huzara, was well advanced. Half the cost of the work is met by His Highness, and half from Local funds.

180. Consequent on the abolition of the *Wuzeer Bhoolar* and *Philor* boat bridges, on the completion of the Railway, the boats and material were transferred to the *Shahdera* and *Ferozepoor* boat bridges, and the surplus was applied to the construction of boat bridges over the *Beyn Nuddee*, on the *Julundur* and *Nakodur* road, and over the *Ravee* at *Cheechee-wutnee*, in the Montgomery District.

COMMUNICATIONS.

Beas.

#### *Boat Bridges and Ferries.*

181. New superstructure was constructed for the *Wuzee-rabad* boat bridge, in the Goojrat District.

Wuzeerabad.

182. The superstructure of the *Jhelum* boat bridge was completed up to the quantity sufficient for 75 boats with trussed beams; and an additional length of planked roadway was constructed, to admit of a sand bank midstream, when flooded in the months of April to June, being bridged with country boats.

Jhelum.

183. Two additional van-boats were built, to facilitate the transit of travellers during the ferry season at *Jhelum*.

184. The materials for the twin-treadle boat and the life boat, for the *Dera Gaze Khan (Koreishee)* ferry, arrived from England, and were set up: the former is reported to have caused a large increase of income, and, so far as can be judged already, to be working well.

Derajat.

#### *River Improvements.*

185. During the hot weather the Indus conservancy establishment was employed mainly at *Dera Ismael Khan* in repairing the boats, &c., and preparing for the winter's work. Their operations in the low season of the river extended from *Kalabagh* to *Mithunkote*. Between *Kalabagh* and *Rokree*, one large snag was removed, and between *Rokree* and *Meanwalee* 19 snags, some of them of large size.

186. Between *Meanwalee* and *Seloo*, a huge Sheeshum tree was broken up by two charges aggregating 220 lbs. of powder, and 18 other snags were removed between *Seloo* and *Pipla*. Most of these obstructions were Sheeshum trees between 9 and 12 feet in girth.

187. Between *Ghrang* and *Dera Gaze Khan* most of the snags proved to be clusters of trees of all sizes locked together, and gunpowder had to be used in almost every instance.

## COMMUNICATIONS.

188. Altogether, the wreck of a large native boat, the brick-work of three irrigation wells, and 189 snags, were removed, and 146 trees cut down between *Kalabagh* and *Mithunkote*, a length of river of over 260 miles.

189. The logs of Sheeshum obtained were sold by public auction at *Dera Ismael Khan*.

*Accommodation for Travellers.*

## Goorgaon.

190. A fine new serai was in progress at *Bewaree*, in the Goorgaon District.

## Hissar.

191. The new serai at *Fazilke*, in Sirsa District, commenced last year, could not be completed for want of funds, but progress was made, and it is expected to be finished in 1871-72.

## Kurnal.

192. A new serai was built at *Neesung*, in Kurnal District, on the *Kurnal* and *Kythul* road, which is said to be of great convenience to travellers; and two wells were constructed at *Mahena* on the former road, and near *Kythul* on the *Thanesur* road, towards the cost of which the Puttiala Maharajah's Vakeel contributed.

## Kangra.

193. Rest-houses were constructed in the Kangra District, at *Dadh*, midway between *Dhurmsala* and *Palumpoor*; at *Sosur*; and at *Gopeepoor Dehra* on the *Beas*, where travellers used to be detained during the rains when there is no boat bridge.

## Goordaspoor.

194. A serai was built at the populous town of *Futtehgurh*, in the Goordaspoor District, where it was much needed for travellers.

## Sealkote.

195. A serai was in progress at *Soomreal*, on the *Sealkote* and *Wuzeerabad* road—delay having been occasioned in selecting a site and in getting materials.

## Ferozepoor.

196. A serai at *Mukkoo*, in Ferozepoor District, commenced in 1869-70, was completed; and additions were made to other serais and supply-houses.

## Montgomery.

197. A rest-house was built on the road between *Montgomery* and *Depalpoor*; and a pucca well midway between *Montgomery* and *Noorpoor*, on the road to *Pak Puttun*.



198. In the *Jhung* District, the full amount of expenditure authorized was incurred on four rest-houses, but the state of work is not reported ; they are said to be in progress.

COMMUNICATIONS.

Jhung.

199. In the *Mooltan* District, the serai at *Chunnoo* was completed ; three rest-houses were built at *Mutteethul*, *Sohooka*, and *Shunee Bukree*, and a rest-house was in progress at *Serai Siddoo*.

Mooltan.

200. A cook-house was built for the *Khangurh* rest-house in the *Mozuffurgurh* District, and a well in the staging bungalow compound at the suddur station.

Mozuffurgurh.

201. Improvements were made to the rest-houses at *Hurrund*, *Rojhan*, and *Rajunpoor*, in the *Dera Gaze Khan* District.

Derajat.

202. The serai at *Choorkana*, in *Goojranwala* District, destroyed by flood, was rebuilt.

Goojranwala.

203. The serai at *Darapoor*, on the *Jhelum* and *Pind Dadun Khan* road, was completed ; and improvements were made to supply-houses at *Sohawah* and *Kullurkahar*, in the *Jhelum* District.

Jhelum.

204. The serai at *Bhera*, in the *Shahpoor* District, commenced in previous year, was completed.

Shahpoor.

205. A house adjoining the Post Office at *Rawul Pindee* was purchased as a dāk bungalow, and, by the addition of two sets of rooms, has been adapted for the accommodation of travellers. The serais at *Barakao* and *Tret*, on the road from *Rawul Pindee* to *Murree*, which were much needed, were completed ; two additional sets of apartments were provided in the *Barakao* staging bungalow ; materials were collected for additions to the *Devul* staging bungalow on the road to *Cashmere* ; and two-thirds of a new serai at *Huzroh*, in the *Rawul Pindee* District, were completed.

Rawul Pindee.

206. A dāk bungalow for travellers was in progress at *Hurreepoor*, the cost of which is defrayed from Local funds.

Huzara.

207. A serai was built on the *Meamwalee* side of the *Sukesur* hill, partly out of Local funds of the *Bunnoo* District, and partly out of private contributions of the *Lumburdars* of the *Thull*.

Bunnoo.

## COMMUNICATIONS.

Kohat.

208. A rest-house was built at *Dhoda*, and materials were collected for one at *Hungoo*, in the Kohat District.

Peshawur.

209. Additions were made to the *Muttunee* serai, in the Peshawur District, and out-houses built for the rest-house at the same place.

210. Moreover, 12 provincial boat bridges, 360 ferries, 18,101 miles of district roads, metalled and unmetalled, 913 provincial staging bungalows, besides serais and other buildings for travellers, and 246 encamping grounds, were in charge of the Civil Officers, and were maintained in as good order as the funds would admit of.

## MIS. PUB. IMPTS.

## MISCELLANEOUS PUBLIC IMPROVEMENTS.

Delhi.

211. The restoration of the "Dewan Khas" and "Summun Boorj" at *Delhi* was completed. The Memorial Monument on the "*Delhi* ridge" was all but finished. It remained to insert the inscriptions.

Dalhousie.

212. The widening and other improvement of Tara Mall at *Dalhousie* was completed.

Goordaspoor.

213. The work of protecting the town of *Dera Baba Nanuk* from the encroachment of the River Ravee was in progress. A number of tree-spurs placed in the river saved the town from the floods of 1870.

Montgomery.

214. The improvements of station drainage at *Montgomery* were completed.

Ferozepoor.

215. The monument on the battle-field of *Aliwal* was completed. The necessary surveys were made for the project of new water-supply for the city of *Ferozepoor*.

Mooltan.

216. The drainage project for the city of *Mooltan* was matured, and the work well advanced.

*Municipal Works.*

*Municipal Works.*  
Hissar.

217. In the *Hissar* District, gates were put up at three gateways of *Bhewanee*; four public necessities were constructed at *Bhewanee* and *Hissar*; and trenches were dug for the reception of the sweepings and filth of both towns.

218. A gateway was built for the town of *Bahadoorgurh*, Rohtuk.  
in the *Rohtuk* District.

219. Further progress was made in erecting the wall Sirsa.  
round *Ellenabad*, in the *Sirsa* District; the work has now  
been suspended with reference to objections of the Sanitary  
Commissioner. Kunkur metalling was substituted for brick  
paving in main bazaar streets of *Sirsa*; the drainage of this  
town was improved, and drain bridges were constructed; and  
filth trenches were dug outside the town.

220. At *Delhi*, a considerable expenditure was in- Delhi.  
curred by the Municipality in widening the Hamilton road,  
and in new drains; the clock-tower was completed; new  
lamp posts and improved lanterns were put up; new conser-  
vancy carts were constructed, with a shed for their shelter;  
and a wire fence was made round the bandstand garden.

221. Attention was given to the preservation of  
antiquities in the neighbourhood, and the necessary expendi-  
ture was incurred in repairs and in cleansing. Among the  
buildings thus attended to is particularly mentioned one at  
*Khirkee* near *Mehrowlee*, which is described as "a square  
building enclosed by high walls surmounted by conical battle-  
ments with round towers built in them"—the roof being  
arched with masonry over "a forest of pillars."

222. A bonded warehouse was provided at *Soneput*,  
in the *Delhi* District.

223. At *Kurnal*, further improvements, consisting of Kurnal.  
masonry revetments to two sides and a ghat or landing, were  
made to the Kurna tank; and a station road was metalled;  
some streets of the town of *Paniput* were paved; and gates  
were supplied to the town of *Koonjpoora*.

224. Bonded warehouses were established in all the  
octroi-paying towns of the *Goorgaon* District. Further pro-  
gress was made in constructing the large masonry tank at  
*Ferozepoor* Jhirkee, which promises to be a work of consi-  
derable utility when the water from the Jhir is brought into  
it to supersede the brackish well water now used by the towns-  
people, who have contributed towards the cost of the work.  
The drainage of the town of *Bewaree* was improved.

225. The *Kythul* road in the city of *Umbala*, the pave- Umbala.  
ments and metalled streets in *Umbala*, *Roopur*, *Booreah*, and  
*Sadhourah*, and a well at *Jugadree*, and a tank at *Morinda*,  
were improved.

MIS. PUB. IMPTS.  
*Municipal Works.*  
 Simla.

226. At *Simla*, experimental tunnels were in progress for improving the water-supply, and a little more than half of a loan of rupees 5,000 granted by the Government of India for the purpose was expended ; but the results were not very favorable. Station roads were railed, and fenced with wire, and the *Ammandale* garden was improved.

Loodiana.

227. Materials were got for a town-hall for the Municipal Committee of *Loodiana*, to be erected in 1871-72 ; streets were metalled in *Loodiana* and *Machiwara* ; and the sewerage arrangements of *Loodiana* and *Jugraon* were improved.

Julundur.

228. At *Julundur*, the roads from the Railway Station to the Civil lines, and from the town to the Railway Station, were metalled ; streets in the towns of *Rahoon*, *Alawalpoor*, and *Kurtarpoor*, were paved ; and public necessities were built at *Julundur* and *Bilgah*.

Goordaspoor.

229. Portions of the station roads at *Goordaspoor* were metalled and bridged ; and streets in several towns of the district were paved, and drains and bridges were made.

Sealkote.

230. Three blocks of public latrines were erected at *Sealkote* ; latrines were also constructed at *Narowal* ; and streets in *Sealkote*, *Pusroor*, *Zuffurwal*, and *Killa Sobha Singh*, were metalled.

Umritsur.

231. Further expenditure was incurred at *Umritsur*, in compensation for houses, &c., taken up for forming approaches to the block of city buildings, and the construction of one approach, from the direction of the Railway Station, was taken in hand ; and some improvements were made in the drainage and sewerage.

Lahore.

232. At *Lahore*, a masonry water-course was made from the Loharee gate of the city down the Anarkullee Bazaar to the Golbagh ; two bridges on the road to *Meean Meer* were enlarged ; and four public necessities were built for the city and Civil station.

Ferozepoor.

233. Materials were purchased for the new drainage project for *Ferozepoor*, and for the town-hall for the Municipal Committee, the construction of which was commenced ; and a new well was built near the Delhi gate of the town. Streets and drainage of *Mokutsur* and *Dhurmkote* were improved ; gates were supplied to *Futtehgurh*, *Mukkoo*, and *Dhurmkote* ; and a bonded warehouse was provided at *Mokutsur*.

234. Streets were paved at *Pak Puttun* and *Kamalia*, in Montgomery. the Montgomery District, and two kutchra tanks were made at *Hoojra* and *Depalpoor*.

235. The drainage of *Mozuffurgurh* and of *Khangurh* Mozuffurgurh. was improved.

236. Above 30,000 square feet of pavement were laid Derajat. down in the town of *Dera Ismael Khan*; a straight entrance was opened into the Kotwalee market-place, and a gate supplied; and four bridges, and side-ways to gates, were constructed. Further progress was made in metalling station roads at *Dera Ismael Khan*. Public necessities were constructed at *Dera Ismael Khan*, *Kolachee*, and *Bukkur*, and new streets were made at *Leia*.

237. At *Dera Gaze Khan*, improvements were made to the road from the kucherry to the dispensary, and to other station roads,—to the well known as *Bhawuldeen*,—and to market-places in the town.

238. Compensation was paid for buildings to be destroyed in widening streets of *Goojranwala* and *Wuzee-rabad*, and for a market at *Pindee Bhutteen*; a large hollow near the *Goojranwala* Jail was filled; and the station garden was improved. Goojranwala.

239. Two bridges were built on the road connecting the *Rawul Pindee* Civil lines with the cantonment. Antiquarian researches were continued at *Shahkideri*; and some coins and a curious reliquary box, found on what is supposed to be the site of a Buddhist temple, were sent to the Lahore Central Museum. The drainage of the town of *Rawul Pindee* was improved; and a well was built outside the town on the road leading to *Murree*. Streets in the towns of *Futtehjung* and *Kookho* were paved with stone. A slaughter-house, huts for the conservancy sweepers, and additional reservoirs for water, were constructed at *Murree*; and revetment walls were built along station roads. Rawul Pindee.

240. At *Goojrat*, the road from the town to the Goojrat. kucherry was metalled; streets in *Goojrat*, *Jalalpoor*, and *Kadirabad*, were paved and bridged; and part of the *Goojrat* town wall was renewed.

241. At *Pind Dadun Khan*, in the Jhelum District, Jhelum District. streets were paved, stagnant hollows filled, compensation was

- MIS. PUB. IMPTS.**  
**Municipal Works.**  
**Jhelum District.**
- paid for buildings removed for straightening and widening streets, and for the removal of a sheepfold and tannery objectionably situated; improvements were made to the canal which supplies the town with sweet drinking water; a bund was built, to keep out water coming from *Kheora*; and measures were taken for the preservation of Dadun Khan's tomb. A station road at *Jhelum* was metalled.
- Shahpoor.**
242. A street in the *Shahpoor* bazaar was paved, and station roads were bridged. A new gateway was built for the salt mundeel at *Bhera*; the circular road of this town was raised and bridged. A tank at *Meanee* was improved with metalled approaches and a ghat; hollows near gates of the town were filled; and the drainage was improved. A gateway of *Sainwal* was completed and a hollow filled; and streets were raised and paved. Two gateways were built at *Khooshab*, the principal street was paved, the drainage was improved, and two necessities for women were built. The streets of *Jhawareeah* were paved.
- Huzara.**
243. Drain bridges were made in the station of *Abbottabad*, in Huzara.
- Kohat.**
244. A pucca water-course was made from the fall spring, through the town of *Kohat*, the townspeople subscribing three-fourths of the cost; and a new town gateway was built.
- Bunnoo.**
245. In the town of *Edwardesabad*, in the Bunnoo District, improvements were effected in the drainage, and in the levels of streets; a verandah was added to the town tower; and gateways received pucca floors. Public necessities were built at *Shekh Booddeen*.
- Peshawur.**
246. Additions were made to the building at *Peshawur* for the accommodation of native visitors of distinction; further expenditure was incurred in filling and levelling near the Jail and the Small Cause Court, in the purchase of drainage bricks for the city and in the construction of drains; 59 new latrines were built in and out of the city; and part of the city wall was renewed.
247. Besides the above, a sum of 69,624 rupees was expended by private persons for public works in the *Kurnal*, *Goorgaon*, *Hissar*, *Rohtuk*, *Julundur*, *Hoshiarpoor*, *Kangra*,

*Umritsur, Goordaspoor, Sealkote, Lahore, Ferozepoor, and Huzara* Districts. The works executed comprise—

- 5 Serais for travellers ;
- 3 Dhurmsalas for ditto ;
- 38 Masonry wells for ditto ;
- 2 Tanks and large reservoirs for water ;
- 1 Public garden ;
- 4 Other works.

MIS. PUB. IMPTS.  
*Municipal Works.*  
Peshawur.

248. New cattle-pounds were built at *Agroha*, in the Hissar District, at *Dubwalee* and *Narail*, in the Sirsa District, at *Pindaeen*, in the Hoshiarpoor District, at *Puthankote* and *Moondie Khel*, in Goordaspoor District, at *Nuthana* and *Ghull*, in Ferozepoor District, at three localities in the Goojranwala District, at *Khariamwala*, in the Goojrat District, and at *Peshawur* and *Taoroo*, in the Peshawur District. Cattle-pounds.

249. It was ascertained that some of the existing cattle-pounds were not sufficiently under the eye of the sentry at the Police stations, and attention of Officers was directed to the subject, in view to the defect being remedied. Four cattle-pounds were thus altered in the Shahpoor District and two in the Jhelum District.

250. About 1,239,584 trees were planted out along district roads, and at encamping grounds, &c., in the Delhi, Kurnal, Hissar, Rohtuk, Sirsa, Umbala, Kangra, Umritsur, Sealkote, Mooltan, Jhung, Rawul Pindee, Goojerat, Jhelum, Shahpoor, Peshawur, Dera Ismael Khan, and Dera Gaze Khan Districts. Arboriculture.

251. Additional grants-in-aid were given for the construction of wells in hilly tracts in the Hoshiarpoor District. Thirteen villages were thus aided during the year, and some of the wells were completed. Wells.

#### AGRICULTURAL

252. The operations in this Division were confined chiefly to current repairs and maintenance ; extensive repairs to one or two of the works having been entrusted to the Special Works establishment, which will be noticed below.

253. Some works were executed in connection with the embankment along the Beas, erected some years ago to keep floods out of the low tract under the town of *Kanowan*.

AGRICULTURAL.  
ORIGINAL WORKS.  
*Baree Doab Canal.*  
1st Division.

AGRICULTURAL.  
ORIGINAL WORKS.  
*Bares Doab Canal.*  
1st Division.

They answered their purpose during the rains of 1870, but it is evident that further measures will be necessary to check the encroachments of the river, which has eroded the bank in dangerous proximity to the embankment.

254. The correct demarcation of the boundaries of the canal lands, which has become a matter of considerable importance since the introduction of regular legal procedure, was commenced, and will be completed as soon as practicable.

255. *Repairs.*—The usual repairs and clearances to main canal and distributaries were carried out at a cost of Rs. 57,693. The canal was closed for four days in September and 20 days in January for special repairs to some of the rapids and overfalls, and for clearance of deposit near the head. The quantity taken out amounted to 1,225,177 cubic feet.

256. The repairs to the protective works in connection with the hill torrents were very slight. The diversion of the *Chukkee* torrent and the other collateral works have turned out most successful, and now give little trouble.

257. *Plantations.*—Those existing have been maintained and added to as far as funds would admit.

2nd Division.

258. The substitution of permanent water-course heads, formed of machine-made earthen pipes, for the wooden tubes formerly adopted, was continued. Rs. 24,068 were expended on this item.

259. A short distributary at the termination of the central line, the *Vahn* rajbuha, was completed at a cost of Rs. 5,828, and an escape to the *Shalimar* rajbuha costing Rs. 1,923.

260. The demarcation of boundaries was pushed on, and will, it is expected, be completed in four or five months.

261. *Repairs.*—The usual repairs, &c., and special silt clearance during the closure of the canal, were effected at a cost of Rs. 78,975.

262. *Plantations.*—Operations chiefly confined to maintenance of existing plantations and nurseries. Expenditure Rs. 5,175; on fuel plantations Rs. 3,472 in addition.

3rd Division.

263. This Division comprises the *Kussoor and Sobraon Branches* of the canal, the detailed estimates for which were submitted in the previous year, and received the sanction of the Government of India on the 30th May 1870. All expenditure is chargeable to loan funds.

264. At the commencement of the year under review, excavation was just begun, and materials for masonry works were being collected.



265. By the end of the year the alignment of the *Kussoor Branch* had been marked out to within six miles of its termination, that of the *Sobraon Branch* to its end. Nearly all the levels had been taken to determine the positions of the distributaries. Eight weeks more, it is reported, would complete these operations.

266. Excavation was in progress along 50 miles of the *Kussoor*, 40 miles of the *Sobraon Branch*; the total lengths being respectively 90 and 67 miles.

267. Rs. 37,397 were expended on compensation for land. It was expected that all the land required would be occupied and compensated for during the ensuing year.

268. Manufacture and collection of materials for masonry works were actively pushed on, and the preparation of revised estimates for the works, of which the designs had been altered. The progress on these works has been satisfactory.

269. This Division comprises the work for remodelling the present main channels and completing the project generally, with the exception of the *Kussoor and Sobraon Branches*.

AGRICULTURAL.  
ORIGINAL WORKS.  
*Baree Doab Canal*.  
3rd Division.

Special Works Division.

270. *Dam across Racee at head.*—The progress on this has been most satisfactory. The total length is 2800 feet. Of this 2250 feet was in hand at the commencement of the year; at the close it was almost finished, and has since been completed right across the river in time to be tested by the floods of the present rainy season. The main items of work executed during the year were—

Excavation	...	...	2,045,601 cubic feet.
Masonry	...	...	782,900 "
Boulder work	...	...	5,224,681 "

It may be interesting to note here that this work has been carried out by a European Contractor, formerly an Overseer on this canal; one of the few instances of men of this class succeeding in contracts of the kind.

271. *Remodelling of the central line between the Kussoor and Lahore Branch regulating heads.*—By the close of the year the excavation and embankments along all but four miles of the total distance, 24 miles, were finished. Expenditure up to close of year Rs. 2,43,163; out of total estimate Rs. 2,90,304. A large quantity of materials was collected at the sites of the several masonry works.

272. Revised estimates for the latter were partly completed, and designs and estimates for completion of the entire canal scheme put in hand.

273. *Repairs.*—The two works alluded to above in the 1st Division were the reconstruction of a lock, half of which

AGRICULTURAL  
ORIGINAL WORKS.  
Special Works Division.

had failed, on the *Deenanuggur* navigation channel, which was completed at a cost of Rs. 33,973, and some heavy repairs to the old dam at the regulating head of the canal, which cost Rs. 9,727.

Workshops, Madhopoor.

274. The completion of the workshop buildings is still in abeyance pending final orders.

275. The work turned out was less than formerly. The out-turn of the foundry amounted to 832½ maunds, and the weight of wrought-iron work from the shops aggregated 186 maunds besides sundry tools, surveying requisites, &c. The work turned out from these shops is first rate, but from the high rates charged through a misunderstanding of the orders regarding the rates of work, customers have decreased. During the year the question was raised whether one workshop at another site would not answer the purposes both of the State Railways and the Canals, the *Madhopoor* establishment being reduced to the extent required for repairs of local works. Until a decision is come to on these points, and the future scope of the shops determined, they cannot be expected to exhibit successful financial results. A workshop is a necessity in connection with all large works, though it may not always be possible to show that *by itself* it is commercially profitable.

Lower Sutlej and Chenab.

276. These are the Inundation Canals in the *Mooltan* District.

277. Three inspection houses were completed. Seven road bridges commenced in the previous year were finished.

278. *Repairs*—New supply channels were excavated for two of the Canals.

279. The annual silt clearances were effected as usual by statute labor.

280. The *Chenab* embankment or levées above *Mooltan* was repaired.

281. No floods of any considerable magnitude occurred during the year.

Upper Sutlej Inundation Canals.

282. Only ordinary repairs and clearances in progress during the year.

283. The *Sutlej* having settled into a cold weather channel most unfavorable to the supply of the several canals, new head channels were commenced, and partly completed at the close of the year.

284. Observations for discharge of the canals at varying heights of gauge were set in hand.

285. The demarcation of the canal lands, and preparation of a correct register, were commenced.

286. The operations in this Division comprise the contouring of the tract of low land on the right bank of the *Sutlej* between *Ferozepoor* and *Mooltan*, and the preparation of designs for developing irrigation in this tract and on the left bank of the river.

AGRICULTURAL.  
ORIGINAL WORKS.  
Special Survey Division, Lower Baras Doab.

287. From May to October the establishment were occupied in plotting field work executed during the previous cold season. Sufficient detail had been collected to admit of drawing up a general sketch of projected works and rough estimate, which was accordingly done. The printing is now nearly completed, when the report will be ready for submission. The project comprises the construction of a dam across the *Sutlej* near *Ferozepoor*, as proposed first in 1856 by the late Colonel J. C. Anderson, with a net work of channels therefrom on right and left bank of the river, and an alternative scheme in case the construction of the dam were not deemed advisable for extending the present Inundation Canal system in the low land on the right bank of the *Sutlej* between *Ferozepoor* and *Mooltan*.

288. Additional levels and surveys were taken in the ensuing cold weather.

289. Lines were levelled from site of dam above *Ferozepoor*; on left bank to the boundary of *Bhawulpoor*; on right bank to *Mooltan*, a distance of 300 miles; accurate surveys of the present course of the river above and below the dam site were partially completed; detailed sections of existing nullahs, which it is proposed to supply with water from the *Sutlej*, were carefully taken, aggregating 672 miles in length.

290. The discharge of the *Sutlej* at site of dam during an ordinary flood in the month of August was measured, and found to amount to 102,799 cubic feet per second. When the river was at its lowest on the 19th January 1870, the volume was 6477 cubic feet per second.

291. The operations were almost entirely confined to the maintenance of the existing canals.

Indus Canals Division.

292. Two inspection houses at *Rajunpoor* and *Boolewala* were about three-fourths completed.

293. Additions were made to two of the river embankments or levées, the *Shah Jumal* and *Bahar Shah*.

294. The length of canal channels cleared of silt was 425½ miles. Petty repairs to various masonry works.

295. Gauges were set up at the heads of all the canals, besides two additional in the *Indus*, and registered daily.

## AGRICULTURAL.

ORIGINAL WORKS.  
Indus Canals Division.

296. Questions which were raised as to the rights in these canals have deferred the projection of many contemplated improvements. On some of the points, definite conclusions have been arrived at, and the rest will, it is expected, be disposed of ere long.

## Special Survey Division.

297. This Division was constituted with the view of obtaining data and projecting improvements and extensions to the existing irrigation right and left of the *Indus*. Operations have hitherto been confined to the right bank under the *Suleiman* Range of hills. Cross sections of the *Dera Gaze Khan* District at intervals of four miles apart, commenced in 1868, were completed in the previous year. In the summer of the year under review, all the data previously obtained were put into shape. In the winter, a line, 103 miles in length, was surveyed and levelled for a proposed main supply channel, with cross sections a mile apart, to determine the best alignment. Detailed sections of several of the existing canals and two or three of the larger hill torrents were levelled. Lines of levels were carried northward as far as *Dera Ismael Khan*. In all 700 miles were levelled and surveyed, and 52 square miles surveyed during the year.

298. Data had thus been obtained by the close of the year to admit of the preparation of a general scheme and sketch estimate for improving and developing, as far as possible, the irrigation in the *Dera Gaze Khan* District, which it was expected would be completed ready for submission by the close of the present summer.

Mozuffurgurh  
Canals.

299. The Inundation Canals in this District have not hitherto been under the control of this Department. The Officer appointed to the superintendency of the *Derajat* irrigation towards the close of the previous year was directed to examine into and report on their present condition and any possible or desirable alterations or extensions of the irrigation there. His report has since been received, and will be dealt with during the present year.

Western Jumna  
Canal.  
Kurnal Division.

300. Operations in this Division, and on the old channels of the canal generally, confined, with a few exceptions, to the maintenance of existing works and irrigation.

301. The excavation of a short channel to cut off one of the loops in the tortuous upper portion of the canal, over which a new bridge for the road between *Umbala* and *Saharunpoor* is being erected, was commenced.

302. The new escape into the *Jumna* from the bifurcation of the *Delhi Branch* at *Ber* was all but finished by the close of the year. It was expected to be ready for use throughout before the rains set in. Of the total quantity to be excavated, 47,997,800 cubic feet, about 3,500,000 cubic feet were executed during the year, leaving about 2,250,000 cubic feet to complete—

			Rs.
Total estimated cost	...	...	1,59,786
Expended to close of year	...	...	1,48,659

303. The demarcation of the boundaries of canal lands was nearly completed.

304. This operation entails considerable labor on these canals, the old channels into which water was admitted 40 or 50 years ago not having then been formally taken possession of by Government.

305. *Repairs.*—The temporary bunds across the *Jumna* at the heads were commenced in August and completed in January at a total cost of Rs. 9,037.

306. A high flood down the *Sombe and Putrala* torrents on the 28th June, impinging obliquely on the dam at *Dadoo-poor*, carried away four of the masonry piers. The breach was closed temporarily, and the piers renewed in the course of the ensuing cold weather. Petty repairs were executed to various masonry works along the canal line.

307. No extraordinary floods occurred in the *Jumna*, though the local fall of rain along the foot of the hills between it and *Umbala* was unusually heavy.

308. Owing to the exceptional local flood thus caused, the embankment made across the *Pandhohee* Nullah three years ago to divert drainage water from the canal was breached, the escape channel connected with it not being sufficiently capacious to carry off the unlooked-for addition.

309. It was not possible to close the canal for repairs and silt clearances, which latter were here and there much required, owing to the great and constant demand for water in the lower districts.

310. The demarcation of boundaries was well advanced during the year. Delhi Division.

311. *Repairs.*—The usual repairs and clearances of main channel and distributaries were carried out at a cost of Rs. 26,393.

312. One breach occurred in the bank of the main channel during the rains owing to an exceptionally high supply caused by a sudden and heavy fall of rain.

313. Rs. 663 were expended on maintaining existing plantations.

AGRICULTURAL.  
ORIGINAL WORKS.  
*Western Jumna*  
*Canal.*  
Kurnal Division.

AGRICULTURAL,  
ORIGINAL WORKS.  
*Western Jumna  
Canal.*  
Hansi Division.

314. The demarcation of boundaries in British territory nearly complete. The question is still pending in *Jheend*, where no boundaries were fixed since the canal was first excavated.

315. Only the usual repairs and maintenance operations carried out at a cost of Rs. 36,135.

New Hansi Branch  
Division.

316. From March to December the establishment was employed on preparing maps, designs, and estimates for the projected new canal and other collateral works, as well as taking additional surveys and levels. The aggregate lengths levelled and traversed amounted to 672 miles.

317. Excavation of the main line had been commenced as a famine relief work towards the close of the previous year. About 15,800,000 cubic feet were thus excavated. The manufacture of bricks for inspection houses and the other masonry works was carried out on a small scale.

318. Labor for excavation is a difficulty in these districts, the villagers preferring daily rates of pay to the usual system of petty contract or job work.

Special Survey Division.

319. This establishment was altogether employed on the surveys, designs, and estimates, for the alterations and new works.

320. Surveys and levels, aggregating 915 miles in length, were completed during the year.

321. The survey of the existing net-work of water-courses required for laying down the projected system of distributaries was well advanced by the close of the year.

Project for additions  
and alterations to  
Western Jumna  
Canal.

322. During the hot weather a design and estimate was drawn up for the proposed masonry dam across the *Jumna* at the heads of the Eastern and Western Jumna Canals, and forwarded for the opinions of the North-Western Provinces Government.

323. In January and February report was drawn up on the whole scheme for alterations and additions to the existing canals, with approximate estimate, amounting to Rs. 1,29,21,990, comprising two new channels, one running to the westward into the *Sirsa* District, the other to the south into the dry tract north of *Jhujjur*; the remodelling of the present channels from the heads to *Delhi* and *Rohtuck*, providing for navigable communication from the Punjab Railway crossing opposite *Umbala* to *Delhi* and the new *Agra* canal, nine miles lower down, together with a complete system of distributaries, and the dam across the *Jumna* at the heads above alluded to. This was submitted for the orders of the Government of India in March last.

324. Pending orders on the above scheme, three Officers were detached in January from the Western Jumna Canal to survey and report on the practicability of drawing water from the *Swat* River in the *Peshawur* Valley for the irrigation of an extensive tract of high land in the *Eusufzai* District, which now lies almost uncultivated for want of water. The value of developing cultivation in these parts is enhanced by the political benefits which would probably result in inducing men of the wild tribes beyond the frontier to settle in the plains and take to the peaceful pursuits of agricultural industry.

AGRICULTURAL.  
ORIGINAL WORKS.  
Peshawur Irrigation.

325. Sufficient data was collected by these Officers to admit of drawing up preliminary designs and a sketch estimate of probable cost, which are now being prepared, and will, it is expected, be ready for submission to Government by the end of the present hot weather.

326. The sanction of the Government of India to the detailed designs and estimates for the upper 37 miles, or main line, was accorded on the 9th June 1870, and was confirmed by a despatch from the Secretary of State dated 30th September following. All expenditure, except the share of the Native States concerned, is debitable to loan funds.

Sirhind Canal.

327. The following progress was made on the shelter for the establishment :—

1st Division.

Executive Engineer's quarters and office at *Roopur* finished.

2nd class inspection house at *Roopur* all but complete.

1st class inspection house at *Roopur*, and 2nd class at *Kumalpoor*, half done.

Amount expended Rs. 17,738 against Budget grant of Rs. 24,600.

Scarcity of labor, chiefly masons, prevented their completion within the year.

328. Three temporary quarters for Assistant Engineers, nearly completed at the beginning of the year, were finished.

329. Temporary quarters for Clerks were commenced.

#### *Excavation.*

Total quantity	...	...	...	...	500,000,000
During the year	...	...	...	...	20,420,000
Up to close of year	...	...	...	...	25,100,000
Expenditure during the year	...	...	...	...	Ra. 1,64,283
Budget grant	...	...	...	...	" 1,79,133

AGRICULTURAL.  
ORIGINAL WORKS.  
1st Division.

Of the total excavated during the year, nearly 3,800,000 was taken out by prison labor in several modes adopted as experiments. Wagons containing 25 cubic feet on tramway, drawn by a horse; wagons containing five cubic feet on narrow tramway, into which the spoil was lifted from below; and, thirdly, by wagons on tramway on a gradient of 1 in 10.

330. A trial was commenced with an engine lift, which promises well.

331. *Materials for masonry works.*—

	Cubic feet.
Block kunkur quarried ... ..	754,000
Boulders ... ..	61,000
Lime-stone ... ..	102,000
Fire-wood ... ..	88,000

The existence of a large stratum of block kunkur so near the heavy works is an immense advantage. Few, if any, bricks will be required. No similar stratum has been found anywhere else in the Province so near the hills.

332. The compensation for the land occupied had, with a few trifling exceptions, been paid by the close of the year.

333. As usual, at the commencement of every large work, many difficulties were met with, which are being gradually overcome. The scarcity of labor still continues; and as the experiment of employing prisoners has proved successful with the limited number of 500, it has been decided to increase the numbers to 3000, to be located at different points along the line as soon as shelter can be erected for them. The results hitherto show that the work tends to keep the men in health, but it has been found necessary to increase their rations above the usual Jail allowances.

334. The prisoners' work is valued by measurement, and charged to the canal at rates not exceeding those for free labor.

2nd Division.

335. The progress in erection of permanent shelter for establishment is as follows :—

1st class inspection house at *Raipoor* was completed.

Ditto ditto at *Nahrpoor* one-fourth done.

Ditto ditto at *Gurhee Turkhan* one-eighth.

2nd class inspection houses at *Khirree* and *Poawut* completed; that at *Nahrpoor* nearly so.

	Rs.
Budget appropriation ... ..	28,000
Expenditure ... ..	18,700

336. *Temporary buildings.*—Assistant Engineers' quarters and Executive Engineer's office at *Gurhee Turkhan* completed.



Budget appropriation	...	...	...	...	Rs. 18,000	AGRICULTURAL.
Expenditure	...	...	...	...	14,868	ORIGINAL WORKS.
337. <i>Excavation.</i> —						2nd Division.

Total	...	...	...	...	500,000,000
Executed during year	...	...	...	...	45,600,000

By petty contracts, with the exception of a small quantity by an engine lift, which is not yet working regularly.

Budget grant	...	...	...	...	Rs. 2,00,039
Expended	...	...	...	...	1,97,898

Expenditure on rails, engines, and workshops are included in above aggregate.

338. The expenditure on each mode of working both in this and the 1st Division are registered separately, but it is too soon yet to compare results.

339. *Masonry works.*—None yet commenced, except the bridge for the Punjab Railway, built by its employes. It cost about Rs. 1,50,000 against estimate amounting to Rs. 1,75,000.

340. Rs. 26,823 were expended on manufacture of stock for masonry works.

341. The payments of compensation for land were nearly completed during the year. Rs. 46,571 were expended on this account in the *Puttiala* territory out of a Budget grant of Rs. 47,961.

342. The surveys and levels necessary for designing and estimating the whole of the branch canals, except the navigable communication with the Western Jumna Canal, were completed. The designs and estimates for about 100 miles of the branch channels were nearly finished at the close of the year. All, it was expected, would be ready for submission to Government in the course of the present year. The total Budget grant—

					Rs.
For the canal, exclusive of establishment,					
was	...	...	...	...	9,44,200
Expenditure	...	...	...	...	8,15,121

343. The progress made on this canal cannot but be considered very satisfactory considering the difficulties encountered, not the least of which has been, and still is, the inexperience of the junior Officers and want of knowledge of natives and their customs. In the course of time these will disappear, but meantime progress is thereby rendered slower than it might be.

344. The difficulties connected with the agreement with the Native States participating in the benefits of this canal, have been, it is confidently believed, at last overcome. A revised draft of the terms was submitted for the approval of the Supreme Government in December last, and a final and satisfactory adjustment may be expected ere long.

Survey Division.

## GUARANTEED RYS.

## GUARANTEED RAILWAYS.

Amalgamation of the four separate undertakings of the Scinde, Punjab, and Delhi Railways.

345. An Act of Parliament, which received the Royal assent on the 12th July, authorized the amalgamation of the four separate undertakings of the Scinde Railway Company, viz., the Scinde Railway, the Indus Steam Flotilla, the Punjab Railway, and the Delhi Railway, into one Company, entitled the Scinde, Punjab, and Delhi Railway.

Economy in cost of management.

346. This amalgamation of the four Companies will, it is expected, lead to considerable economy in the aggregate cost of the management, as well as conduce to greater simplicity in the arrangements for working the traffic along the Indus Valley route.

Indian affairs of the Company subordinate to the agency at Lahore.

347. The Indian affairs of the Scinde, Punjab, and Delhi Railway have been made subordinate to the agency at Lahore; but no definite decision has yet been arrived at with regard to the conduct of the Government control over the Company, a proposal being now under consideration of the Secretary of State for India for the Government control to be exercised direct by the Government of India without the intervention of the Local Government.

Opening of section between Julundur and Philor and arrangements for through-booking.

348. A section of Railway between Julundur and Philor, 24 miles in length, was opened on the first day of the year. On the same date arrangements were introduced by which goods might be booked between all the principal stations from Calcutta to Kurrachee over the only remaining break in the line which then existed, viz., between Philor and Loodiana. These through-booking arrangements were, on the whole, successful, and greatly facilitated the traffic between the Punjab and the Sea-board, so long as this interruption in the through-communication remained.

Opening of section between Philor and Loodiana.

349. The last section of the line, between Philor and Loodiana, including the Sutlej bridge, was thrown open to public traffic on the 15th of October, the opening ceremony being presided over by His Highness the Maharajah of Puttiala. The opening of this section practically completed the construction of the Railway, and threw Lahore and Calcutta into direct Railway communication.

Subsidence of a pier of the Sutlej Bridge.

350. Owing to the subsidence of one of the piers, fears were at one time entertained that the opening of the Sutlej bridge would have to be postponed; the pier, however, subsequently bore, without yielding, the same proof-test to which the rest of the bridge was subjected, and no further movement of

the pier has since been observed to justify any apprehension as to the safety of this bridge, beyond what may be felt with regard to this, still considered by some, experimental class of construction on single well piers.

**GUARANTEED RYS.**

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351. At the commencement of the rains heavy floods occurred down the Chittung and Markunda rivers, which breached the Railway embankment between Jugadree and Burrara, and stopped all goods traffic on the line from the 29th June to the 2nd of July. But slight interruption, however, took place in the passenger traffic and the transport of the mails.

Interruption of traffic between Jugadree and Burrara by heavy floods.

352. The adoption of the metric system of weights and measures, which was expected to have been introduced on all the Guaranteed Railways during the year, has been indefinitely postponed, pending the settlement of the question of the general introduction of these standards throughout the country.

Introduction of the metric system of weights and measures.

353. An Act to regulate the carriage in Railway trains of dutiable goods across customs cordons is in contemplation, the provisions of which are similar to the customs regulations on Railways in force on the Continent.

Act to regulate carriage in Railway trains of dutiable goods across custom cordons.

354. Experiments have been carried on throughout the year with the object of decreasing the number of fires caused by sparks from the engine, and the results promise to be satisfactory. Other experiments, conducted with a view to protecting Railway passengers from excessive heat in the carriages, have not yet resulted in the invention of any simple arrangement for cooling Railway carriages which appears likely to be generally adopted.

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Experiments for decreasing the number of fires caused by sparks from engine.  
Experiments for cooling Railway carriages.

Statement showing the progress made in construction of Railways in the Punjab, and the state of their working, from 1st April 1870 to 31st March 1871.

NAME OF RAILWAY.	Mileage open during the year.	Total mileage open.	PASSENGERS DURING THE YEAR.					Receipts from passengers.	Receipts from merchandize and miscellaneous.	Total receipts.	Working expenses.	Net profits.	Number of European Staff.	Number of Native Staff.	Total expenditure from commencement.	REMARKS.
			1st Class.	2nd Class.	Intermediate.	3rd Class.	Total.									
Punjab and Delhi ..	32	554	14,156	52,778	8,101	18,11,588	18,81,578	19,10,410 5 11½	18,52,801 14 9	87,62,712 4 8	27,78,154	9,57,838	422	383	6,68,19,714	

## STATE RAILWAYS.

*Punjab Northern Railway.*

355. The opening of the year found the work on this line quite in an elementary, but not unsatisfactory, state. The delay which was at first apparent in giving effect to the orders of the Supreme Government, and in organizing the staff on the Public Works system, was fast disappearing under a change of management; and the purchase of a quantity of Tools and Plant from Messrs. Brassey and Co. placed in the Engineers' hands the most necessary mechanical appliances. The permanent-way material, which had reached Calcutta during the cold season, was daily arriving in Lahore, and the prospect of a good out-turn of work during the season was very encouraging.

356. But ere long several causes arose tending seriously to retard progress in actual construction, and yet the year has been a busy one for the Staff, and very considerable results have been obtained.

357. Of the retarding causes the chief has been the alteration in gauge. The question of this change, its advantages and possibilities, began to be discussed very early in the year; and although the Engineers were still employed in preparing the final estimates on the 5' 6" gauge, yet the growing probabilities in favor of the narrower track led to all works likely to be seriously affected by the change being arrested pending the final decision. Another cause which operated against constructive progress, although in a minor degree, was an alteration in the spans of the openings of the large bridges, which was determined upon in England, and a doubt as to whether these were to be constructed on the 3' 3" gauge as a finality, or in such a manner as to be readily convertible to the then existing Indian standard.

358. Early in January, final orders for the adoption of the 3' 3" gauge were issued by the Indian Government, and the work of construction at once received an impetus productive of very satisfactory results; but this change of gauge added very materially to the labor of the Engineers; for not only had the works of the line to be pushed forward adequately to the wishes of the Government, but the whole of the estimates, which had been completed on the 5' 6" gauge, had to be recast to suit the radical change which the recent orders introduced in the rolling-stock as well as in the width of track.

359. At the close of 1870-71, the work stood as follows:—

Land had been taken up and occupied.

## STATE RAILWAYS.

*P. N. Railway.*

General remarks on state of the works on opening of the year.

Adoption of the 3' 3" gauge.

Works at the close of the year 1870-71.

## STATE RAILWAYS.

*P. N. Railway.*

*Earth-work* had been completed, except in the approaches to the large bridges and in the Kharian pass diversion, which had, however, progressed fairly.

*Small bridges and culverts* had made excellent progress. The minor works of this class near Lahore and Goojranwala had been completed, and the conversion of the larger ones on the Trunk Road, to adapt them for Railway purposes, was far advanced.

*Stations and Staff accommodation* had been nearly completed.

*Flush gaps and flood openings* had not made much progress. Their introduction is a novelty in Railway Engineering, and involved a good deal of discussion as to how far the principle should be carried. All requisite material was, however, stacked on the sites, so that the work could be turned out of hand with great rapidity and a minimum of inconvenience to the public.

*Permanent-way* for the new gauge had been ordered in England, but none had arrived in this country. Of the rails for the old or 5' 6" gauge that had reached Lahore, something over 12 miles were utilized in temporary road and tramways, and the remainder are available for transfer to the Irrigation Branch, where there is full use for them.

*Sleepers* were at first cut for the 5' 6" gauge, and 30,000 had been sawn. These can all be used for the smaller gauge without serious loss. Some 11,000 of the smaller scantling have since been cut. The subsequent completion of the steam sawing apparatus at the Ravee and Chenab, and the re-fitting of the water-power mill at Dhuleyal on the Jhelum, now permit sleepers to be turned out at the rate of 1,000 a day.

For construction purposes, two temporary wooden bridges of some magnitude have been erected—one over the Pulkoo nullah, 421 feet long, connects the Wuzeerabad brick-fields with the Chenab bridge works; and the other, a pile bridge of 114 spans, having 1594 feet of clear waterway cross the cold-weather channel of the Ravee, connects Shahdera with the Lahore Station, and the material yards and store depôts with the permanent bridge works.

*Large bridges.*—Well sinking in piers and abutments had not commenced; but a considerable supply of well-curbs had been obtained. Protective or training works on the Ravee and Chenab have been constructed on a large scale, and with very considerable success on the latter river. Those on the Ravee are very tentative, and consist of a series of dams to prevent a flow of water down the nullah known as the back channel. The floods of 1870 breached the head works, and showed an element of weakness where such was not looked

for. The Chenab works are continuous bunds of great extent and solid construction, and have hitherto been all that could be desired.

STATE RAILWAYS.

*P. N. Railway.*

360. Whilst the gauge discussion militated against constructive operations, it allowed ample time to organize arrangements for the supply of materials for the larger works, and the year's operations in this respect have quite satisfied anticipation. The out-turn has resulted in—

96 lakhs of sound well burnt bricks ;  
 200 lakhs moulded and ready for burning ;  
 1,45,450 cubic feet of lime burnt or ready for the kilns ;  
 73,000 cubic feet of soorkhee, besides a vast amount of  
 bats ready for grinding ;  
 4,85,000 maunds of wood-fuel for kiln purposes ;  
 4,60,000 of timber in log ;  
 1,700,000 cubic feet of ballast.

361. With the exception of the reduction of a Superintending Engineer, Mr. Collet, who was transferred to the Indus Valley Railway, the establishment of the Punjab Northern State Railway has remained much the same as it was in 1869-70. The position of Chief Engineer has been held for nearly the whole year by Mr. A. Grant, who was appointed on the departure of Mr. Lee Smith, deputed on special duty to England.

Establishment.

Appointment of Mr.  
 Grant as Officiating  
 Chief Engineer.

362. This former gentleman's exertions have been very satisfactory, and he has shown himself thoroughly competent to fill the onerous post he holds.

363. The Engineers as a body still continue to merit the high opinion which has been expressed of their professional talents ; but some few of the younger members of the staff are not so efficient as they should be, and evince but little desire to improve.

364. The Store Department has been organized during the year ; and although the Store-keepers were mostly new to their peculiar duties, it has, on the whole, worked well, and reflects credit on the management of Mr. W. Watson, Chief Store-keeper.

Organization of the  
 Store Department.

365. The progress of work on this line has frequently been made the subject of unfavorable comments in the public prints, mainly because the travelling public see but little of the vast operations in hand.

Unfavorable com-  
 ments in public  
 prints with regard  
 to progress of  
 works.

366. It is generally known that the line is to be laid on the surface of the Trunk Road, and a casual observer, seeing none of the recognized Railway material in the shape of rails,

## STATE RAILWAYS.

*P. N. Railway.*

chairs, sleepers, ballast, occupying the road surface, forms the conclusion that there is no progress ; but it has been the policy of the Government to avoid blocking the road with Railway material until the permanent-way and rolling-stock shall have arrived from England.

367. The occupation of half of the Trunk Road between the time of laying the permanent-way and opening the line for traffic will be full of inconvenience to the public, and it is manifestly to its interest that this period should be reduced to a minimum ; accordingly, the present working arrangements have been made with this view.

*I. V. Railway.*

State of progress at the close of 1869-70.

*Indus Valley Railway.*

368. When the year 1869-70 closed, the Indus Valley Line was quite in its infancy. Survey porters were at work between Mooltan and Roree, a length of about 183 miles. Having started late, the Engineers were hard pressed to get the data ready before the rains set in, and remained in the field until far into the hot weather season, but the preliminary survey operations were at length completed, and the Staff adjourned to Murree, there to elaborate the surveys and plans. Alternative estimates were prepared on the 5' 6" and on the 3' 6" gauge, and submitted to the Supreme Government by the end of September 1870.

Estimates on 5' 6" and 3' 6" gauge.

Mileage rate of the two systems.

369. The average mileage rate on the two systems was as follows :—

On 5' 6" gauge	...	...	...	...	...	£ 7,285 per mile.
" 3' 6" "	...	...	...	...	...	6,171 "
Difference	...	...	...	...	...	<u>1,064</u> "

Mooltan and Roree sections—sub-division of.

370. The Section between Mooltan and Roree was divided into two Districts : the Upper or Mooltan District was at first placed under Lieut.-Colonel Innes, R. E., v. c. ; and on the transfer of that Officer to the higher appointment of Accountant General, Public Works Department, Mr. Collet, C. E., was transferred from the Punjab Northern State Railway, and placed in charge of the work as Superintending Engineer. The Lower or Roree District was held from the commencement by Mr. Nethersole, C. E.

Estimate for the Mooltan District.

371. The estimates for the Mooltan District were accepted, and the acknowledgments of the Supreme Government conveyed to Colonel Innes and Mr. Collet for the complete way the preliminary investigations of the line to be adopted, and the subsequent estimate of cost, were prepared.



# APPENDIX A.

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, IMPERIAL, FOR THE YEAR 1870-71.

*Schedule A.—Ordinary and Extraordinary.*

SERVICE HEADS.	Grants.	Outlay.	DIFFERENCE.	
			Unspent balance of grant.	Excess.
ORIGINAL WORKS.				
Military ... ..	17,10,000	18,93,065	8,16,935	
Civil Buildings ... ..	8,72,000	2,65,881	1,06,119	
Agricultural ... { Extraordinary ... ..	19,94,000	11,27,609	8,66,391	
{ Ordinary ... ..	2,30,000	1,33,271	96,729	
Communications ... ..	2,75,000	2,89,107	...	14,107
Miscellaneous Public Improvement ... ..	23,000	1,90,473	...	1,67,473
	46,04,000	88,99,406	12,04,594	
REPAIRS.				
Military ... ..	2,90,000	3,04,880	...	14,880
Civil Buildings ... ..	46,000	85,311	...	39,311
Agricultural, Ordinary ... ..	5,44,000	3,58,909	1,85,091	
Communications ... ..	5,28,000	5,55,669	...	22,669
Miscellaneous Public Improvement ... ..	11,000	10,609	391	
	14,24,000	13,15,378	1,08,622	
ESTABLISHMENT.				
Agricultural, Extraordinary ... ..	6,36,000	5,56,917	79,083	
Other services ... ..	13,13,000	15,60,626	...	2,47,626
	19,49,000	21,17,543	...	1,68,543
TOOLS AND PLANT.				
Agricultural, Extraordinary ... ..	7,20,000	4,604	7,15,396	
Other services ... ..	81,000	64,400	16,600	
	8,01,000	69,004	7,31,996	
Profit and Loss ... ..	...	7,231	...	7,231
Total ... ..	87,78,000	69,08,562	18,69,438	
Less decrease in Stock ... ..	...	2,39,787	2,39,787	
Add increase to balance of London Invoice, Ordinary ... ..	...	52,469	...	52,469
	87,78,000	67,21,244	20,56,756	
Deduct expenditure in England ... ..	8,100	63,573	60,413	
Public Works Proper ... ..	87,74,900	66,57,731	21,17,169	
STATE OUTLAY ON GUARANTEED IRRIGATION WORKS AND RAILWAYS.				
Guaranteed Irrigation Works.				
Guaranteed Railways ... ..	57,000	77,108	...	20,108
GRAND TOTAL ... ..	88,81,900	67,34,839	20,97,061	

## APPENDIX A—concluded.

Expenditure on Imperial Works from funds supplied in addition to the Budget grant.	Amount of contribution.	Outlay.	Less.	More.
<b>LOCAL FUNDS.</b>				
Original Works—Civil Buildings ... ..	16,609	17,438	...	829
<b>CONTRIBUTIONS.</b>				
Original Works—Civil Buildings ... ..	279	279		
Agricultural, Ordinary ... ..	966	827	139	
Repairs—Military ... ..	47	47		
Agricultural ... ..	2,51,126	57,667	1,93,459	
<b>TOTAL ... ..</b>	<b>2,69,027</b>	<b>76,258</b>	<b>1,92,769</b>	

## APPENDIX B.

### PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNT OF THE PUNJAB FOR 1870-71.

Particulars.	Amount.	References.
<b>ADDITIONS.</b>	<b>Rs.</b>	
<i>Nil.</i>		
<b>REDUCTIONS.</b>		
Reduction in grant Ordinary, on account of stores from England ... ..	8,100	Government of India's letter No. 477—98 dated 14th October 1870.
<b>Total Reduction ... ..</b>	<b>8,100</b>	

D. C. GORDON,  
for Controller Public Works Accounts, Punjab.

372. Orders were also passed permitting certain works to be proceeded with in anticipation of the submission of the completion estimates; but in consequence of a contemplated diversion towards Ahmedpoor, in the Bahawulpoor territory, and a discussion regarding the propriety of taking a detour *via* Shoojabad near Mooltan, ground was not broken in 1870-71.

#### STATE RAILWAYS.

##### *I. V. Railway.*

Construction of certain works ordered.

373. The estimates for the Roree District were found incomplete, chiefly in the part affected by the Indus floods, which breasted the proposed line north of Roree. The subject is one of great difficulty, and requires to be treated theoretically and practically, as there is absolutely no data on which to base the calculations of the volume of water pouring over the banks of the Indus, and submerging the country for miles.

Estimates for the Roree District.

374. Colonel O'Connell, an Officer of experience in both Canal and Railway work, was deputed to investigate the subject, and, if possible, solve the difficult problem. This Officer's report is now in preparation, and the pains he has bestowed on the matter, coupled with his high reputation, affords every hope that he will deal with his subject in a satisfactory and practical manner.

Deputation of Colonel O'Connell to investigate Indus floods.

375. Pending the final decision as to the manner of dealing with this flood-water, the estimates for the Roree District remain of necessity incomplete.

Estimate incomplete pending final decision of dealing with flood water.



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ANNUAL  
PROGRESS REPORT  
OF  
PUBLIC WORKS IN PUNJAB,  
FOR THE YEAR  
1871-72.



LAHORE:  
PUBLIC WORKS DEPARTMENT PRESS.  
1872.



Note to accompany Annual Progress Report of Public Works in Punjab,  
for the year 1871-72.

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The new arrangements under which the charge of raising and of administering funds for certain specified purposes is committed to the Local Governments, came into operation in the past year. Under these arrangements three of the classes into which Public Works are divided are, with certain exceptions, dealt with as Provincial, and executed from the Provincial and Local Funds; namely, (1), *Civil Buildings*, with exception of buildings for the Post Office and Telegraph Departments, which remain Imperial, (2), *Communications*, with exception of Railways, and (3), works of *Miscellaneous Public Improvement*.

2. *Military Works*, and *Irrigation Works*, together with the Civil Works above-noted as exceptions, are executed and maintained from Imperial Funds.

3. The administration of the Imperial Funds allotted to these works, and the direction of the works themselves, are divided. Military buildings generally, in stations of British Troops, the State Railways, and the control exercised over the Guaranteed Railways, are under the direct management of the Supreme Government. Other Military Works generally, all works of Irrigation, and the buildings belonging to the Post Office and Telegraph Departments, together with the Civil Works executed from Provincial and Local Funds, are under the management of the Provincial Government.

4. The part of this arrangement which concerns Military buildings has only come into operation from the beginning of the present official year; and that which relates to Railways, during the course of the past year. The present Report, therefore, of Public Works under the Punjab Government, for the year 1871-72, includes these two classes of works, which are not now part of the charge of the Provincial Government.

5. Military Works form the first class in the usual order. The Punjab contains, of all the Provinces, the largest proportion of the British Troops in India; and the Military Works therefore, independently of those belonging to the western frontier and the troops which guard it, are numerous and important.

6. The Province, at the same time, is favored with a large extent of hill territory, not on exposed frontiers, presenting opportunities of keeping large numbers of the British soldiers in a temperate climate; and of removing to selected positions, at suitable elevations, men whose health has suffered in the hot climate of the plains. These advantages have been largely used, and their use can be extended. A considerable proportion of the Military buildings now maintained, or under construction, are for the accommodation of British soldiers and their families on the hills.

7. The principal Military Works in progress during the past year have been new barracks in various stations in the hills and in the plains, and the new Arsenal at Rawalpindi. Improvements and alterations in the barracks of the new construction, which are being erected for British Troops, have been suggested by the experience of those already occupied. Such of these improvements and alterations as can be introduced in the barracks of this kind which have been already built, have been carried out in certain of these buildings; and they will be more fully included in the first construction of the buildings of the same kind still to be erected. No certain conclusions can be drawn at present from the results of the occupation of these buildings, with regard to their advantages or disadvantages in comparison with buildings of other kinds for soldiers. Further experience in all parts of the country is required, and specially of the remedial measures which are being applied.

8. While further large expense has to be incurred in the erection of barracks, it appears likely that considerable reduction of cost can be effected in the construction of the subsidiary buildings, and of the houses for the regimental non-commissioned staff, &c. The use of sun-dried instead of burnt brick, for instance, is, for some of the subsidiary buildings, sufficient, and in certain respects preferable. At many places in the hills, a much less expensive style of building for the accommodation of the European soldiers, also, can advantageously be used, as experience has shown.

9. No important works of Fortification have been done during the past year, with exception of the new Posts in advanced positions on the Tank frontier of the Derah Ismail Khán District. The new Arsenal at Ráwalpindi is in progress. The works that have been constructed are the buildings to be enclosed within the defences, the design of which defences had not been finally determined at the close of the year. The fortifications of the Fírozpúr Arsenal in their present form are of a kind less complete and efficient than originally designed. The reduction was made on considerations of time and money, when the defensive work had to be constructed. An improvement of the fortification is now required, and is about to be made. The questions of the Fort at Multán, and of the Place of Refuge at Abbottabád in Hazará, are in abeyance. Also of the Refuges in other stations. The work of the enclosed cantonment of Pesháwar is suspended, awaiting further orders on questions now under consideration. For the line of forts and outposts along the trans-Indus frontier, little (with exception of the building of the advanced Posts above mentioned) has been required during the past year, beyond ordinary repairs and maintenance. When, as in certain cases during recent years, the condition of the old outposts has called for the erection of new ones, the opportunity has been taken of reviewing the requirements of the position, and of taking up a new site when it appeared desirable, in order better to fulfil the purposes which the Post is meant to serve.

10. Measures are in progress for the improvement of the water-supply for cantonments. For some stations water is to be conducted from suitable sources at a short distance. For good wells, which are to continue in use, pumps have been supplied. Wells, when the supply of water is both abundant and good, and obtainable at moderate depth, have the advantage that they are more locally under command, and that they are less open generally to contamination, if ordinary care is used, than other sources of supply. That they can be seriously contaminated has been shown by sufficient experience; but it was no ordinary neglect of the ground in the neighbourhood of wells that polluted the drinking water long in use at Míán Mír.

11. The trials in the Punjáb, of Norton's tube wells, at places where water is found near the surface, have not, up to this time, been generally successful, except near Pesháwar, where they were used with great advantage at the time of the Fair in the cold season of 1870-71.

12. Among the works undertaken with the view of obtaining an improved supply of water for a cantonment, was the Artesian boring at Ambálah. The circumstances under which this first experiment has been brought to a close were these :—Provision had been made for a boring five hundred feet in depth, with tubing of three successively diminishing sizes. In the hope of obtaining a better supply from a greater depth, after the five hundred feet boring had been completed, tubing of a still smaller diameter was obtained. This smaller tube broke at a depth of a little over seven hundred feet. The tubing originally used was not designed for a deeper boring than five hundred feet. A new boring should be made with larger sized tubes adapted for greater depth. The position has been pronounced by the Officers of the Geological Survey to be a very promising one for an Artesian well.

13. Along with the supply of good water, the provision of wholesome bread for the troops is one of the most important requirements; and the erection of bakeries on an approved plan has furnished the means of supplying this want in all the principal stations for British Troops.



14. Barracks constructed with some of the iron frames which were sent from England in 1858 to facilitate the rapid erection of shelter for the suddenly increased number of European Troops in India, were built some years ago at four places (Amar Sidhú, Hallokí, Niáz Beg, and Bhikháwál) at short distances from Mían Mír, to be used to give cover to the troops of that station in case of their being obliged to move out from the cantonment on account of sickness, as in 1861 and at other times. These camp barracks have been re-roofed to keep them in habitable condition in case of need.

15. The planting and tending of trees in cantonments, which has been carried on yearly, has improved the appearance of places that were bare and unattractive, and even depressing in their dreariness, especially in the hot weather. And there is little doubt that this improved appearance, and the greater cheerfulness it gives to the surroundings of the barracks, as well as the trees themselves, when they are sufficiently grown, will contribute materially to the healthiness as well as the pleasantness of the cantonments.

16. The barracks at Ráwalpindi are now lighted with gas. The petroleum from which it is made is obtained at present from a place in the neighbourhood of Fattah Jang, about twenty miles west of Ráwalpindi. It has hitherto been obtained from open excavations or shallow borings in the oil-bearing strata. The quantity obtained in this way is very moderate. The oil is found at a number of other places in the same and the adjoining Districts.

17. The demands on account of Civil Buildings continue large, and will so continue for some time. The accommodation in the Districts for the Revenue and Police Establishments, which was provided, on the British occupation of the Punjáb, in buildings hastily constructed, or in old native buildings converted to answer the purposes, has required in many places to be renewed; and new buildings are being constructed, in the same or in other places. The accommodation required in these classes of buildings has lately been under revision, with a view to the preparation of new general plans, some of which have been completed.

18. New Jail accommodation on a large scale is still required. The principal new Jails erected during the last few years have been those at Montgomery and at Derah Ghází Khán. Some of the other Jails have been enlarged and improved. The largest work of this class now required is the new Jail at Amritsar, of which the enclosure wall has been built and the wells sunk. It is required to accommodate a thousand prisoners, and its cost is estimated at upwards of five lakhs. Other new Jails or enlargements of existing Jails are required. The new Jails lately, and now being, erected, are planned to meet the demands of the present approved systems of Jail discipline and administration; and the demand, which has of late years become unhappily larger and more general, of provision for European prisoners.

19. Some District and Divisional Court Houses require to be supplied or enlarged. A building for the Chief Court at Lahore, designed some time ago, awaits provision of funds. The Court is held in the building which was formerly the Residency, and has for some years past been used for public offices. A new Court room was added to the building two years ago.

20. Some large educational and other buildings of importance have to be erected as funds become available. The building for the Lahore College is about to be commenced on the site at present occupied by the old barrack which has for many years been made to serve, in a very imperfect way, for the Medical School. This old barrack is to be dismantled gradually, as required, to make way for the new building; the Medical School being temporarily accommodated in hired buildings, till its own new building, on the site reserved near the General Hospital lately completed, can be erected.

21. The main lines of Military communications, between the several cantonments and towards the western frontier, are also, to a great extent but not altogether, the chief commercial routes, and the chief of those which serve the purposes of the Civil administration. All of these, except the railways, remain under the control of the Local Government, and endeavour is being made to supply funds for them in such measure as to maintain them in condition adapted to meet the respective demands upon them.

22. The Trunk Road, which has been for the most part closely followed by the main line of railway, continues to support a large amount of local, and even of through, traffic. For some years the money allotted for the repair and maintenance of this trunk line, and the other chief highways hitherto reckoned imperial, has been inadequate, and did not admit of a sufficient provision being made of material for future use, in addition to the execution of current repairs.

23. The amounts allotted for this purpose, in the Budget of Imperial Funds, for the past seven years, have been—

	Rs.						
1865-66	...	...	...	...	...	...	8,34,240
1866-67	...	...	...	...	...	...	8,18,590
1867-68	...	...	...	...	...	...	8,88,405
1868-69	...	...	...	...	...	...	7,73,851
1869-70	...	...	...	...	...	...	5,93,845
1870-71	...	...	...	...	...	...	5,55,669
1871-72	...	...	...	...	...	...	5,60,000

The reductions made, during the last four of these years, of the means of maintenance, while at the same time the extent of roads to be maintained was annually increasing, have occasioned some undesirable curtailments of width of metalled roadway, and diminution or postponement of annual repair and maintenance work. The amount allotted from the Provincial Funds for the current year is Rs. 7,18,940.

24. The outlay from Local Funds during the past seven years, for repair and maintenance of minor highways and District roads, (the greater part unmetalled), has been—

	Rs.						
1865-66	...	...	...	...	...	...	1,34,292
1866-67	...	...	...	...	...	...	1,68,729
1867-68	...	...	...	...	...	...	1,57,715
1868-69	...	...	...	...	...	...	1,49,504
1869-70	...	...	...	...	...	...	1,54,729
1870-71	...	...	...	...	...	...	1,68,398
1871-72	...	...	...	...	...	...	1,93,333

The provision in the current year for the same purpose, from District Funds, is Rs. 2,68,870.

25. The importance, independently of their military uses, of the roads which intersect the country, and furnish the means of inter-communication between the cities and commercial centres, and of interchange of products between districts differing greatly in natural and acquired resources, can scarcely be over-rated. The extent of useful roads is increasing. The cost of maintenance must necessarily and properly be large. It is an outlay distinctly, though indirectly, remunerative.

26. And in a country exposed to great alternations of climate, and subject to water floods of great violence and magnitude, the outlay on repair and maintenance of communications must always be a very necessary and important item of Public Works expenditure.

27. Notice is given in the Report, under the head "Communications," of the injuries done to the roads last year by the unusual floods in the rivers. The rain-fall in the hill regions was extraordinarily general and heavy, whilst in the plains it was not excessive, and in some parts less than the average.

28. The Report of the Guaranteed Railways describes the heavy damages sustained by those works last year.

29. The Consulting Engineer has noticed (para. 410) the very unremunerative income of the line between Lahore and Multán. It will always be

remembered that this line, by itself, could offer no promising prospects. The intercourse between the present termini themselves is very limited. The country through which the line passes has little to contribute, in the way of either supply or demand, to the traffic of a railway. It is only when this line has been placed in unbroken communication with Sind and the sea that the goods traffic can be looked for which will justify its construction. The preparations for completing this line, which have been going on actively during the past year, are described in the "Indus Valley Railway" section of the Report.

30. The most important works on the line of the Punjab Northern Railway, between Lahore and Jhelam, have been the commencement of the bridges over the great rivers, and the river works connected with them, which are briefly described in the Report, paras. 431, &c.

31. The ferries, both those on main lines of road and those belonging to District, or purely local, communications, are under the charge of the Civil Officers, who both manage the ferries and collect the income from them. Certain of the principal boat bridges are under the Public Works Officers. When the boat bridges are dismantled for the season, on the rising of the rivers, the charge of the *ferry* crossing, then resumed, is taken up by the Deputy Commissioner.

32. The water highways, characteristic of the Punjab, furnish most useful means of transport, of certain kinds and in certain directions; but the shallow and shifting channels of the rivers are unfavorable to such steamer traffic as has hitherto been tried, and the upward passage especially is, for both steamers and country boats, tedious and uncertain. Downwards there is considerable export by the rivers of the produce of the country, and, among other things, of the boats themselves, built on the upper parts of the rivers, near the timber supplies, and which, after making one downward passage, are sold in Sind for local traffic on the lower Indus.

33. The Indus Flotilla of the Punjab Government has now been given up. The only work connected with the river navigation which has been dealt with in the Public Works Department, though not carried on under Public Works Officers, is the Indus river conservancy, conducted mainly in aid of the Steam Flotilla. The conservancy operations of the past year, the removal of obstructions, the watching and improvement of the channels, &c., are briefly noticed in the accompanying Report. The abolition of the Steam Flotilla has rendered unnecessary the continuance of these river conservancy operations.

34. Not much advance has been made in the use of the Punjab canals for navigation. But an important new line of navigable communication, it will be seen, (Report para. 383), will be provided in connection with the irrigation works of the Sirhind Canal, now in course of construction.

35. The floods of 1871, which did so much damage to road and railway works, affected also the heads of the irrigation canals, as mentioned in the Report (paras. 282—288, 300, 329—331); and occasioned, as with the other works, heavy outlay in repairs.

36. The extension of irrigation, from the best available sources of supply not yet so used, has engaged much attention during the past few years. Examination has been made (paras. 334, &c.) of the facilities for carrying out a project of long standing, for a canal from the left bank of the Indus, for the supply of water to part of the country between that river and the Jhelam. The permanent character and solid material of the river banks and channel near Kálábágh and Mári had often suggested the suitability of that place for the head of a canal. A canal from that point might also be an important means of water-carriage to and from this part of the upper Indus, as well as of supply for agricultural purposes.

37. Further progress has been made (para. 344) with the preparations for drawing water from the Swát river for the fertile plain of Eusafzái.

38. The Chináb near Chiniót has at one part a rocky channel, presenting facilities for the construction of the head of a canal; which place, like the Indus at Kálábágh, has long been looked to as inviting another future irrigation pro-

ject. A first rough examination of this proposal has also been made during the past year (para. 355 of the Report).

39. These are the principal new projects which have been under consideration, for permanent irrigation canals, to be taken in hand as funds may be procured, and first to be designed in detail as competent hands can be made available. The extension of the usefulness of the canals supplying periodical irrigation in the flood season,—the Inundation Canals of the Lower Satlaj and Chináb, and of the Indus,—has also received much attention.

40. There remain many other valuable supplies of water not yet fully utilized by systematic irrigation works. Of these one of the most important (before referred to in the Note prefixed to the Annual Progress Report of Public Works in Punjab for 1868-69, para. 46) is the Kuram river, in the Bannú District. The economical direction and distribution of the water of this river,—in a trans-Indus region not cultivated to the extent of its capabilities, not well peopled, and bordered by an active population of unsettled but not unreclaimable habits,—is a work of the greatest importance, in its political bearing, no less than in respect of its influence on the improvement of the wealth and resources of the western parts of the Province. The Lieutenant Governor has directed Colonel Crofton to report upon the best means of extending irrigation from the Kuram during the ensuing cold season.

41. The majority of the District works, roads and buildings and miscellaneous works of improvement, are in charge of the Civil Officers. Many of the places where these works are required are remote from the ordinary ranges of the duties of the Public Works Officers; whose relation to these works, (when recourse to them is necessary) consists chiefly in assistance and advice regarding the proposals made, and preparation or review of the estimates, and inspection of the works when required. Their personal employment on the execution of the Minor District Works is exceptional. At the time of the preparation of the Annual Budget, the agency to be employed,—Civil or Public Works Officers,—is determined. And a transfer of the charge of a work from one agency to the other, which is done whenever this is found convenient and expedient, is made under the specific orders of the Government in each case.

42. A large amount of useful work is under the sole direction of the District Officers. In some instances a deficiency of immediate supervision on the part of the superior Officers has led to faulty execution and consequent loss. It is a mistake, (which former experience and notices of it by the Government, to all Officers concerned in such works, have not succeeded in getting rid of,) to suppose that when works are committed either to a Contractor, or to the care of one of the District subordinates, the supervision on the part of the responsible Officers may be relaxed. Contracts have their uses; and the employment of subordinates, to be present on the works during execution and see orders properly carried out, is necessary. But neither the Contractor and the men employed by him, nor the District Overseers or Superintendents of Works, can safely be entrusted with the entire charge of executing the works exactly in the manner directed in the drawings, specifications, and written or oral instructions, and with workmanship of the kind that is required. It is only while the work is in progress that the quality of it can be rightly perceived, and that errors can be checked and corrected without loss of time and money.

43. It is proper that the charge of works should not be undertaken by any Civil Officer who is not prepared to exercise the necessary personal supervision. The time of District Officers is very fully occupied, and it is only when Public Works can, without any hurtful interference with their other duties, be conveniently superintended, (as they can be, very largely, under methodical treatment, in connection with the Officer's other arrangements) that the superintendence of new works should be committed to them. Many of the District Officers have special taste and qualification for the execution of works, and the arrangement is very advantageous. When it cannot properly be made, with

justice to both classes of duties, then different provision for the superintendence is required, though at additional expense, or with some inconvenience.

44. The charge of encamping grounds and of the supply-houses, wells, and other works connected with them, has always been in the hands of the Civil Officers. Likewise, for the most part, the saráis and dák bungalows. The accommodation for travellers, in all parts of the Province, and for the Civil and Police Officers in their tours through the the Districts, has been much improved and extended during the past few years. At the same time disused saráis and encamping grounds have been given up.

45. The little works mentioned in the string of notices of local District and Municipal improvements, though they appear individually unimportant and collectively uninteresting, represent much that is of local value in more ways than one. The promotion of the health, the cleanliness, and the protection, of towns and villages,—the encouragement of improved personal and social habits,—improved provision for the comfort and refreshment of travellers,—improved supply of water for man and beast, and for agriculture,—defence of lands and dwellings from inundations,—these are among the direct and valuable uses of the many little pieces of work carried out in all Districts, often in obscure places, and in very unpretending ways. They are at the same time alike the means and the marks of an advancement—(in a very small way, it may be)—of local interest on the part of the people in local improvement, and local action in devising and providing for local wants ; which, together with other things, is helping forward the wholesome growth of young municipal institutions.

R. MACLAGAN, COLONEL, R. E.,  
*Secretary to Government Punjáb,*  
*Public Works Department.*

*August 30, 1872.*



PROGRESS REPORT  
OF  
PUBLIC WORKS IN PANJAB,  
FOR THE YEAR 1871-72.

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PART I.—MILITARY.

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The only work in hand during the past year connected with the Military buildings at *Dehli*, besides minor and petty works, was a bakery for the garrison in the Palace.

2. In connection with the project for remodelling the old barracks at *Ambálah*, the work on Nos. 1, 2, and 4 barracks in the Royal Artillery Lines was completed. In the British Cavalry Lines, No. 5 barrack was finished. No. 1 barrack in the Artillery Lines was covered with a roof of slates on one-inch planks. The roof of No. 5 barrack, Cavalry Lines, was constructed of *Jabbalpur* tiling on planks.

3. The roof of No. 5 single men's barrack in the British Infantry Lines was re-slatted.

4. In the Royal Artillery Lines, quarters with out-offices for the Quarter Master Sergeant were taken in hand, and the work well advanced. Two harness-rooms on the standard plan were constructed. The roofs of these buildings were made of Goodwyn tiling.

5. In the British Cavalry Lines, quarters were constructed for a Commissariat Sergeant.

6. In the British Infantry Lines, the work of providing quarters for families made good progress. Blocks Nos. 133 and 134 for eight families each were completed during the year. A bungalow for Staff Sergeants in these lines was built.

7. Progress was made in the provision of cook-houses for the new family barracks for the several arms at *Ambálah*. In the Royal Artillery Lines, one-fourth of the masonry of the buildings was executed. The cook-houses in the British Cavalry Lines were nearly all finished. In the British Infantry Lines, cook-houses for 25 families were completed, and those for 20 other families were in progress. These cook-houses are built on the *Nasirabad* pattern.

*Ambálah.*

8. For the rest-house at *Ambálah* for troops travelling by rail, a second block of quarters for 88 men was completed with out-offices. The rest-house for the Commissariat Department also was finished. The extension of the platform leading from the Railway station to the rest-houses was finished.

9. The Artesian boring operations at *Ambálah* were suspended owing to the fracture of the three-inch pipes. The boring had been taken down to a depth of 700 feet. A separate report on the subject of these operations was submitted to the Secretary to Government of India, Public Works Department, with this office No. 2530 dated 11th May 1872.

*Dagshái.*

10. Of the three full-company barracks under construction at *Dagshái*, Nos. 1 and 2 were completed, and No. 3 barrack was very nearly finished.

11. The necessary subsidiary buildings for these barracks were taken in hand,—three cook-houses, three lavatories, and a latrine. The masonry in nearly all of them was completed, and the roofing was in progress.

12. A site for an additional full-company barrack was also made ready.

13. Subsidiary buildings for the family quarters,—four cook-houses, two latrines, and a water-tank,—were completed. Also a drain and railings for these quarters.

14. Lightning conductors were put up on ten of the old company barracks.

15. The substitution of corrugated iron for zinc in the roof of the inner verandah of the hospital at *Dagshái*, and the re-roofing of the hospital out-buildings with the same material, made good progress.

16. Some rooms in the Military prison were converted into solitary cells, and the road from the water-tank to the Military prison was railed.

17. The skittle alleys were improved, and the barrack furniture godown re-roofed.

18. It had been proposed to remove the old barracks for single men and to erect new buildings in their place. It was determined after careful examination to maintain the old buildings, which were sound and only in need of re-roofing, and some improvement of ventilation.

*Kasaúli.*

19. The front verandahs of Nos. 7 and 8 half-company barracks at *Kasaúli* were enclosed. The wash-house for these barracks was completed.

20. A block of quarters for 24 families was finished, and a latrine for these quarters was nearly completed. The



roofs of Nos. 1 and 2 family barracks were covered with corrugated iron. Kasaúli.

21. The fixing of lightning conductors to two single men's and four family barracks was finished.

22. The new canteen at *Kasaúli* was commenced, and the masonry of the building completed to within three inches of wall-plates. The trusses for the roof were all made up, and the doors, &c., were being prepared.

23. Servants' houses were provided for the Medical Subordinates' quarters.

24. A tank for drinking water was completed. New trees were planted and others maintained in the Cantonment.

25. The substitution of corrugated iron for zinc in the roofs of Nos. 1 and 2 barracks at *Sabáthú* was commenced. Sabáthú.

26. The floors of all the cook-houses attached to the single men's barracks were flagged.

27. The new hospital was finished during the year, and a branch road was made to it.

28. The work of removing the bázár at *Sabáthú* made no progress, as an appeal made concerning it was still pending before the Civil Authorities.

29. A new armourers' shop was taken in hand, and all but completed. The corrugated iron roofing remained to be put on.

30. New quarters for the Warrant Officers at *Jatógh* were completed. A verandah was provided to the Commissariat godown. Jatógh.

31. Of the new barracks for head-quarters and eight companies of a British Infantry Regiment at *Jálandhar*, Nos. 4 and 7 were completed during the year. Work on the superstructure of barracks Nos. 10 and 11 was commenced, but it was countermanded during the year and remained in abeyance. Jálandhar.

32. The improvements to the new barracks, to mitigate the heat and to remove defects in ventilation, were completed.

33. The main guard and cells for British Infantry were completed.

34. Of the five double-storeyed barracks for the Depôt at *Baloon*, Nos. 1, 2, and 4 were completed all but the staircases. In No. 3 barrack, the piers of the upper verandah were built to the springing of the arches. No. 5 barrack was finished. Dalhousie.

**Dalhousie.**

35. A permanent cook-house, wash-house, and privy were provided for No. 1 barrack. Semi-permanent cook-houses for barracks Nos. 2 and 5 were all but completed. Wash-houses were constructed for Nos. 2 and 5 barracks, and two double privies for these barracks were finished.

36. A site was excavated for the proposed slaughter-yard at *Baloon*, but the work itself, as well as that of the guard-room, was not commenced, the allotments for these items having been re-appropriated to admit of greater progress being made with the barracks.

37. The huts at *Banni Khet*, originally constructed for the European Working Party Detachments employed on the road to *Dalhousie*, were re-roofed for the accommodation of troops, and occupied.

**Bakloh.**

38. The hospital for the Gurkhá Regiment at *Bakloh* was finished, and a quarter-guard was built.

**Siálkót.**

39. The temporary stables for Waler horses of the Cavalry at *Siálkót* were completed.

**Mián Mir.**

40. The additions and alterations required to the building purchased at the close of the previous year for the Medical Depôt (transferred from *Siálkót*) were finished.

41. Materials were collected for the works for water-supply from the canal to the Royal Artillery and Infantry Lines at *Mián Mir*.

42. More trees were planted about the Cantonment: those formerly planted have made good progress.

43. The barracks at *Niaz Beg*, *Halokt*, and *Bhikhewál*, for troops sent from the *Mián Mir* Cantonment in time of epidemics, were re-roofed and put into proper order.

**Lahore.**

44. A portion of the Fort wall at *Lahore* near the powder magazine, which gave signs of failing, was reconstructed; and a portion of the wall between the Mastí gate and the south-east bastion strengthened with buttresses.

**Firozpur.**

45. Quarters were built for the Conductor on duty in the Arsenal at *Firozpur*. Six bungalows in the old Royal Artillery Lines were converted into quarters for 21 Warrant and Non-Commissioned Officers attached to the Arsenal, completing the accommodation for the Arsenal establishment.

46. The west gate guard-room in the Arsenal was partitioned off to provide a guard-room, two cells, a canteen, and a store-room for the Royal Artillery garrison. Two entrance gates were also constructed, and two self-registering turn-stiles provided.

47. Lightning conductors were fitted to the powder magazine and other buildings in the Arsenal. *Firozpur.*

48. Accommodation also was provided in the Arsenal for the camp-followers attached to the British Infantry and Artillery garrison.

49. In the British Infantry Lines, the double-storeyed hospital for single men for accommodating 92 patients made good progress. The masonry superstructure of the lower storey was finished, and that of the second floor raised to a height of 11 feet.

50. The 9th remaining block of quarters for families of British Infantry was finished. This building completed the accommodation required for 105 families of British Infantry at *Firozpur.*

51. The hospital for females in the British Infantry Lines was completed.

52. Not much was done on Military buildings at *Multan* *Multán.* beyond minor and petty works. Servants' houses were provided for the British Infantry hospital, and a new wall round the hospital of the Royal Artillery. The trees in the Cantonment were maintained, and additional trees planted.

53. The plunge bath for the British Infantry Detachment, Fort *Akalgarh*, *Derah Ismail Khan*, was finished. Accommodation was provided for the establishment and camp-followers attached to the Detachment. *Derajat.*

54. The work of renewing and raising the roofs and walls of the Native Infantry Lines at *Derah Ismail Khan* was brought to completion.

55. The spurs in the River Indus to protect the *Derah Ismail Khan* Cantonment from the encroachments of the river were watched and maintained.

56. A fortified outpost of boulder stone masonry was built opposite the *Girni Pass* on the *Tank* frontier, and a tank was made for the supply of water for the garrison.

57. A new outpost was built at *Zam* on the same frontier. The former was completed in  $2\frac{1}{2}$  months, the latter in six weeks. A new road was made connecting them. These two posts are the supports of the advanced post of *Kot Khirgi.*

58. A new outpost was built at *Rum-ki-Thul.*

59. A new outpost at *Sabzil-ki-Kot* was in progress during the year. The Artesian boring operations here were brought to a successful termination, resulting in the abundant supply of good drinking water, where formerly the only water obtainable was brackish and unwholesome.

**Talágang.**

60. The quarter-guard and bells-of-arms for Native Infantry at *Talágang*, commenced in the previous year, were completed.

**Jhelam.**

61. The magazine, bells-of-arms, and solitary cells for Native Infantry at *Jhelam* were finished.

62. Several of the roads in the Cantonment of *Jhelam* were metalled and put into proper order.

**Ráwalpindi.**

63. Of the barracks in the Fortified Arsenal Enclosure at *Ráwalpindi*, No. 1, in progress last year, was completed, and No. 2 was nearly finished.

64. Materials were being collected for the gun-sheds in the Magazine Enclosure.

65. Further progress was made with the buildings for the completion of accommodation for British troops at *Ráwalpindi*. In the Royal Artillery Lines the stables were nearly completed. The gun-sheds were completed and occupied.

66. In the Fort Lines, venetians were supplied to the double-storeyed barracks. The voluntary workshops in these lines were finished. Privies were provided for the families in No. 6 barrack.

67. Masonry shafts were provided to three wells in the Fort Lines, and a force-pump was fixed in a well south-east of the lines. Materials were collected for a masonry aqueduct. Some roads in the lines were metalled, and a rifle range was provided.

68. Experimental borings were made in some wells in the Church Lines and Artillery Lines at *Ráwalpindi*.

69. Quarters were provided for the Native establishments attached to the British Infantry hospital.

70. In the Native Cavalry Lines, accommodation was provided for the Native Doctor.

71. New sheds were constructed in the Barrack Master's godown.

72. In connection with the gas-works for lighting the barracks, &c., at *Ráwalpindi*, the laying of the pipes to the Church and Artillery Lines was completed. The hydraulic main was enlarged, and a second gas-holder, with tank, was finished and brought into use.

73. An iron tank for the storage of petroleum for the gas was obtained from the *Roorkee* Workshops, but it was in some respects defective, and had to be re-made. Upwards of 5,000 gallons of petroleum were obtained from the wells a short distance from *Ráwalpindi*.

74. The single men's barracks, Nos. 20 and 21, at *Murree* *Murree*. were completed. Subsidiary buildings were erected for these barracks and for barrack No. 6.

75. The wash-house for No. 9 barrack, commenced in the previous year, was finished.

76. The water tanks, commenced last year, for use in cases of fire, were finished.

77. A Quarter Master's store-room was constructed during the year, and an armourers' shop was in progress.

78. The improvement of the road from No. 6 to No. 8 barrack was carried out, and protective walling and parapets provided at various portions of the roads near the barracks.

79. The additions and alterations to Native Infantry Lines in progress were finished; servants' houses attached to the hospital were in course of execution, and the new Barrack Master's godown was completed.

80. Further progress was made with the work of extending and improving the Gurkhá Lines at *Abbottábád*. The alteration of the Hazará Mountain Battery barracks, taken up now for the Gurkhá Lines, was effected. Two single men's barracks were completed, and four blocks of quarters for families were in progress. Nine of the old condemned buildings were dismantled. The snow and frost of the winter months retarded work at *Abbottábád*.

81. Materials were collected for the family quarters, magazine, mule-shed, and workshops for the Pesháwar Mountain Train Battery at *Abbottábád*. The foundations of several of the buildings were completed, but heavy rain interfered with the progress of the work, which would probably otherwise have been finished during the year.

82. A well was constructed in the Cavalry Lines, and another in a different part of the Cantonment, sunk upwards of 80 feet through rock, was nearly completed.

83. New huts were constructed for the Native Infantry *Attok*. at *Attok*, and cook-houses for them were in progress. A temporary gun-shed at *Attok* was completed.

84. Only minor works and repairs were executed at *Campbellpúr*. *Campbellpúr*.

85. The new lines for Native Infantry at *Kohát* were *Kohát*. completed all but the magazine.

86. The new lines for Native Cavalry were under construction by the men of the Regiment, and a magazine and quarter-guard by the Public Works Department.

87. The works for water-supply of the *Kohát* Cantonment were about three-fourths executed.

Edwardesábád.

88. A commencement was made with a new fortified post at *Adhammá*.

89. The barracks in Fort Dalípgarh, at *Edwardesábád*, were re-roofed. The renewal of the floor of the general hospital was nearly finished.

Naushehra.

90. A Commissariat bakery at *Naushehra* was commenced, and nearly all the masonry work of the building was completed. The timber work was in progress.

Chirát.

91. Huts for 96 men and 6 Non-Commissioned Officers were built at *Chirát*.

Pesháwar.

92. The works on the buildings of the Fortified Enclosure at *Pesháwar* have been suspended during the past year under the orders of the Secretary of State. Little was done beyond the maintenance and repair of existing buildings and some minor works. Two masonry wells for sides Nos. 1 and 2 of the Fortified Enclosure were in progress. A new project has been prepared for water-supply from the Bára River for *Pesháwar* Cantonment and City.

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## PART II.—CIVIL WORKS.

## BUILDINGS.

## BUILDINGS.

93. A new record-room for the Deputy Commissioner's office at *Sirsa* was nearly completed. Revenue.

94. A new distillery was constructed at *Batálah*, in the *Amritsar* District.

95. A new *Tahsil* was in progress at *Jhang*.

96. Work was commenced on a new treasury and record-room at *Abbottabad*, and the superstructure raised to four feet high.

97. A combined *Tahsil* and *Thánah* at *Harrípur*, in *Hazára*, was completed during the year.

98. Additions were made to the Post Office building at *Amritsar*, comprising a large room, 49' × 28', with a record-room and a verandah. Post Office.

99. Additions and improvements were made to the dispensaries at *Bhewání*, in the *Hissár* District, at *Fírozpúr*, *Multán*, *Shújábád*, and *Sheikh Buddín*. General.

100. The new third class dispensaries, with necessary out-offices, at *Ajnálah* and *Taran Taran*, in the *Amritsar* District, were completed. An enclosure wall round the buildings was constructed, and a well provided.

101. The out-offices of the dispensaries at *Gujránwála* and *Waztrábád*, and the house for the *Hakíms* or Native Physicians employed by the Municipal Committee of *Waztrábád*, were completed.

102. An office building for the Forest Department at *Jhelam* was commenced, and made good progress. The roofing remained to be done.

103. The dispensaries at *Pák Pattan*, in the *Montgomery* District, *Hassan Abdal*, in the *Ráwalpindi* District, *Hangú* and *Terí* in the *Kohát* District, were completed.

104. A dispensary at *Pind Dádan Khán*, in the *Jhelam* District, was in progress.

105. A lock hospital was built at *Kohát*.

106. A new roof was put on the Presbyterian Chapel at *Ambálah*. Ecclesiastical.

107. The new cemetery at *Sabáthú* was completed, a cemetery provided at *Jatóg*, and the *Simla* cemetery was extended.

108. Several improvements were carried out in the cemetery at *Dalhousie*, and the enclosure wall was finished.

109. The roof of Christ's Church at *Ráwalpindi* was renewed.

BUILDINGS.  
Educational.

110. The construction of a building for use as a Girls' School at the Lawrence Asylum at *Sanáwar* was taken in hand, and the work half completed. The wood-work of the roof, doors, &c., was in progress. The floors of certain wards and class-rooms in the Lawrence Asylum were renewed.

111. A large new zillah school at *Hoshiárpúr* was under construction, and the work was three-fourths completed. The roof-covering and fittings were in progress.

112. The Medical School Hospital at *Lahore* was completed, and the space round the building extended and cleared. The late Lord Mayo visited and inspected the building in 1871, and consented to its being called the "Mayo Hospital" in commemoration of his visit.

113. Local and Municipal Funds have contributed towards the construction of school-houses in districts. New town and village schools were built at Jamálpúr, in *Hissár* District; at Daulatpúr, in *Kángra* District; at Batar, Badní, Dharmkót, and Makhú, in *Ferozpúr* District; at Kót Tahar, in *Montgomery* District; at Garh Maharáj, in *Jhang* District; at Deví, in *Ráwalpindi* District; and at Hairú, Derí Shah, and Rojhán, in *Derah Gházi Khán* District. A branch school was built at Batálah, in *Gurdáspúr* District. The Pathánkót school, in *Gurdáspúr* District, was being enlarged, to admit of an English class being established. Additions and improvements were made to the schools at Mogah and Jalalabád, in *Ferozpúr* District; to the *Jhang* zillah school and the Maghiánah town school, in the same District; and to the schools at *Muzaffargarh*; and at Sakho, in *Ráwalpindi* District.

Judicial.

114. A Police Station was completed at Bhiwání, in *Hissár* District.

115. A new Police Station, with rest-house and a cattle-pound, and quarters for the Municipal Police, were constructed at Kaarkhauda, in *Rohtak* District, to supply accommodation heretofore afforded in some nazúl buildings which were unsuitable.

116. Improvements were made to the Municipal Police quarters at *Sirsa* and *Fázilká*, and a shed for suitors was constructed at the Assistant Commissioner's Court at *Fázilká*.

117. Late in the year, a new Police Station and Thánah at Nanglowí, on the Bahádurgarh road, in the *Dehli* District, was commenced. At the end of the year, the superstructure of all the buildings, with the exception of the Kacherí, had been raised.

118. The temporary workshops in the Jail at *Dehli* sustained serious damage owing to the unusually heavy rains of the season and the unsuitable character of part of the



materials. The buildings were renewed during the year with alterations and improvements.

BUILDINGS.  
Judicial.

119. A prisoners' property godown was constructed in the Jail at *Ludiánah*.

120. Additions and improvements were made to the Basian circuit-house, in *Ludiánah* District.

121. A range of out-offices, &c., was provided for the Small Cause Court at *Jalandhar*.

122. Municipal Police quarters were constructed at *Batálah*, *Derah Nának*, *Dínanagar*, *Pathánkót*, and five other towns of the *Gurdáspúr* District.

123. Two blocks of solitary cells, commenced in 1870-71, were completed in the *Siálkót* Jail.

124. The outer enclosure wall of the new Jail at *Amritsar* was completed, and a temporary gate provided. Two godowns were built, and nine wells sunk in different parts of the enclosure.

125. A block of out-offices, &c., near the Chief Court building at *Lahore*, was converted to provide accommodation for suitors and others attending the Court.

126. The block of 100 solitary cells outside the Central Jail at *Lahore* was completed.

127. Three padded rooms were provided in the Lunatic Asylum at *Lahore* for violent lunatics.

128. A Municipal Police station-house was constructed at the *Amritsar* gate of the town of *Firozpúr*.

129. The new Jail at *Montgomery* made good progress. The outer enclosure wall, wells, barracks, cells, hospital, guard-rooms, quarantine cells, wards for Europeans and for Civil prisoners, jailors' quarters, godowns and out-offices, Jail garden, enclosure wall, were all completed, as also part of the workshops. The Jail was occupied during the year.

130. The gateway and office at the *Multán* Jail were completed.

131. A Police Station at *Multán* was taken in hand and finished.

132. A Police Station was commenced at *Kabírwála*, in the *Multán* District, instead of at *Narol*, the place originally proposed and named in the Budget.

133. A new cattle-pound was built at *Multán*, and a new Municipal Police station-house outside the *Daulút* gate of the town.

134. The lock-ups of *Thánahs* in the *Muzaffargarh* District were enlarged, and also those at minor Police Stations, for female prisoners.

135. A new Court-house for the Assistant Commissioner at *Rájanpúr*, in the *Deráját*, was taken in hand and completed.

**BUILDINGS.**  
Judicial.

136. The Police Stations at *Jhelam* and *Pind Dádan Khán* were improved.

137. The construction of the solitary cells in the Jail at *Rawalpindi*, previously deferred on account of a contagious fever in the Jail, was taken in hand, and two of the four blocks completed.

138. The Thánah under construction at Khánpúr, in the *Hazára* District, was finished.

139. A small hut for circuit purposes was in progress at Nathagallí, in the *Hazára* District, on the road from *Abbottabad* to *Murree*.

140. A new Thánah was built at Mírián, in the *Bannú* District, and a smaller Police Station at *Sháhbáz Khel*.

141. The combined Tahsíl and Thánah at Lakkí, in the *Kohát* District, was nearly completed. A new Tahsíl and Thánah at I'sá Khel, in the same district, was nearly finished.

142. The iron railings obtained from the Mádhopúr Workshops for the *Pesháwar* Jail were set up, and the work finished.

143. Cattle-pounds were constructed at *Murree* and five other places in the *Rawalpindi* District; at Khárián and Kádrábád, in *Gujrát* District; at *Jhelam* and *Pind Dádan Khán*; at four places in the *Sháhpúr* District; and at Mardán in *Pesháwar* District.

**COMMUNICATIONS.**

**COMMUNICATIONS.**

*Metalled Roads.*

Dehli to Mathra.

144. Some further work was executed on the Panjáb portion of the *Dehli* and *Mathra* road. Sixteen bridges have been completed, and the earth-work in berms and rain-cuts finished up to the 18th mile.

Dehli to Bahádurgarh.

145. The *Dehli* and *Bahádurgarh* road (to Rohtak and Hissár) was proceeded with. Four miles of the metalled road have been completed, and kankar was collected for continuation of the work.

Dehli to Ambálah and Lahore.

146. Notwithstanding unusually heavy floods of 1871, the Trunk Road from *Dehli* to *Lahore* was maintained during the rainy season in fair efficiency. The floods near the Márkandá bridge rose to the height of 12 feet, or two feet higher than the high flood level of former years. The bridge and the road adjoining stood well, and the traffic was unimpeded. In the section of the road through the Biás Valley, three wooden bridges were swept away. The road otherwise was

maintained in fair order. Considerable outlay had to be incurred in special repairs of parts of the road. The injuries sustained by the Railway works between Dehli and Lahore threw considerable additional traffic on the Trunk Road.

COMMUNICATIONS.

Dehli to Ambálah and Lahore.

147. The diversions of the Trunk Road at the Satlaj and Biás Rivers were completed.

148. A diversion of the Trunk Road had also to be made in the *Jálandhar* Cantonment, and the work was nearly completed at the close of the year.

149. The metalled gaps or depressions in miles 33 and 34, required to complete the road from *Ambálah* to *Jagádhri* (and *Saháranpúr*), two of 400 feet each, and two of 100 feet, were made. Six miles of the road received a new coat of metal, and the earthen slopes of these and other miles were repaired.

Ambálah to Jagádhri.

150. The *Jagádhri* road sustained considerable injury during the great floods of July and August 1871. The road was cut across in many places. The large wooden bridges across the Chittang and across the Rákshi were carried away, as well as a smaller wooden bridge across the overflow from the Jamná. The breach caused in the Railway embankment at the same time greatly increased the traffic on the *Jagádhri* road, and the whole of the old line of road between *Jagádhri* and the Jamná had to be kept in good order. To facilitate the traffic, temporary bridges and road diversions were made wherever necessary.

151. A bridge on the 6th mile of the *Ambálah* and *Kálká* road was completed, and the road kept in good repair.

Ambálah to Kálká.

152. The line of Trunk Road from *Lahore* to *Fírozpúr* was maintained in a good state of repair, and the chowkís, &c., along it kept in order.

Lahore to Fírozpúr.

153. The portion of the road crossing the bed of the River Satlaj near *Fírozpúr* was metalled and improved, reducing the great inconvenience of that part of the line.

154. The usual annual and other repairs to the line of Trunk Road from *Ludiánah* to *Fírozpúr* were effected.

Ludiánah to Fírozpúr.

155. An experimental metalled tramway was commenced on the road from *Multán* to *Sher Shah*, and four miles of it completed.

Multán to Sher Shah.

156. Additional grants of money were assigned for the restoration to proper efficiency of the line of Trunk Road from *Lahore* to *Ráwalpindi*, which had much deteriorated in previous years owing to the heavy additional traffic on

Lahore to Pesháwar.

COMMUNICATIONS.  
Lahore to Pesháwar.

the portion between *Lahore* and *Jhelam* due to the construction of the Railway, and the insufficiency of the allotments of funds in past years.

157. The road between *Lahore* and *Jhelam* is under the charge of the Officers of the Northern State Railway, which is being constructed on one-half of the road.

158. The repairs and renewals carried out in the year under review restored the road in great measure to proper order, though difficulties were experienced in the collection of sufficient quantities of kankar metal.

159. On the section between *Attok* and *Pesháwar*, Trans-Indus, a new layer of stone metal was laid down, and heavy repairs executed to the section Cis-Indus between *Báwalpindi* and *Attok*.

*Unmetalled Roads.*

*Káلكá to Simla.*

160. The widening and improving of the cart-road from *Káلكá* to *Simla* to the standard prescribed was completed. A dangerous portion of the *Tára Devi* cliffs near *Simla* was in course of removal, and a revetment wall was constructed. The *Jabla* and *Káلكá* bridges on this line, of masonry, 50 feet span, were finished.

161. This road sustained very heavy damage during the rains and floods of July and August. Interruptions to wheeled traffic by landslips, &c., were frequent, notwithstanding the efforts made to keep the road clear and in proper repair. Extensive special repairs, and the general improvement of the drainage of the road, together with the construction of substantial revetment walls wherever necessary, were commenced.

*Hindústán to Tibet.*

162. The *Yula* bridge in the 132nd mile, on the *Hindústán* and *Tibet* road, 40 feet span, was carried away by a heavy flood in August.

163. The road generally was kept in such repair as the limited allotment of funds allowed.

*Kángra Valley Roads.*

164. Of the *Kángra Valley Road* in the section from *Núrpúr* to *Bandarghát* portions were completed and opened for traffic. The road through the lower portion of the *Núrpúr bázár* was widened, and its continuation under the Fort completed.

165. On the *Bandarghát* and *Baijnáth* section, a new road, two miles in length, was made from *Kachirí*, on the cart road, to *Bohan*. The funds for this work were provided by the Local Committee.

166. On the whole line considerable damage was occasioned by the unusual heavy rain-fall, the severest experienced for

many years in the valley. The temporary bridges on the *Bandarghāt* and *Bajnáth* section suffered; the Soni bridge being completely carried away with its abutments. All inconvenience to traffic was obviated by timely repairs wherever necessary, and the Soni khad was temporarily paved.

COMMUNICATIONS.  
Kángra Valley  
Roads.

167. Great part of the road is now opened for wheeled traffic, and the late Viceroy, Lord Mayo, and the Countess of Mayo, were driven in a carriage-and-four from *Pálampūr* to *Kángra*.

168. The old road from *Pathánkót* to *Dalhousie* was widened from five to ten feet, and otherwise improved. Progress was made with the new mule-road from *Danera* to *Dalhousie*; seven miles were opened to a width of 14 feet, and for 20 miles a four-feet pathway was constructed as a preliminary.

Pathánkót to Dalhousie.

169. The road from *Lahore* to *Shekopúra* was completed, with the exception of one drain bridge and four gaps.

Lahore to Shekopúra.

170. The first and second sections of the road from *Siálkót* to *Gurdáspúr* were also nearly brought to completion. One drain bridge and a number of gaps remained to be done.

Siálkót to Gurdáspúr.

171. The necessary repairs, &c., to roads in the *Salt Range*, were effected.

Roads in Salt Range.

172. Additional parapets and other protections are being made, where necessary, on the road from *Ráwalpindi* to *Murree*.

Ráwalpindi to Murree.

173. The 23rd Panjáb Pioneers were employed during the summer on the widening of the road from *Abbottabád* to *Murree* near Gah and Bagnotár.

Abbottabád to Murree.

174. The improvement of four miles of the road from *Kohát* to *Pesháwar* over the *Súrdag Pass*, on the new line, was completed. A portion of the road at the *Mírkalán Pass* was also improved.

Kohat to Pesháwar.

#### *District Roads.*

175. The *Hissár* District roads were bridged in 16 places.

Hissár.

176. Mile-stones were erected along roads in the *Gurgáon* District.

Gurgáon.

177. The roads leading from *Karnál* to *Saháranpūr*, *Hissár* and *Fírozpūr*, were improved.

Karnál.

COMMUNICATIONS.  
Ludiánah.

178. A small bridge was built at *Deklon*, on the road from *Ludiánah* to *Maler Kótla*.

Hoshiárpúr.

179. A new road was laid out from Buderah to the Nangal ferry, in *Hoshiárpúr* District; the road between *Dasúah* and *Mukerian* was bridged; and a bridge over the *Beyn* at *Barra-tali*, on the road to *Srí Gobindpúr*, was nearly completed.

Kángra.

180. Of the *Kullú* and *Ladakh* road, 23 miles were constructed during the year in various sections between *Koksar* and *Darcha*; and it is reported that laden camels, &c., can now go along the road with ease, the average rise being scarcely 1 in 20, and the maximum under 1 in 10. The *Kachiárit* road, and the old road between *Sultánpúr* and *Mandí*, which had become hardly traceable owing to damages by heavy rain, were reconstructed; and a new line of road was constructed from *Monáli* to *Bulla*, along the left bank of the river, which, besides avoiding the *Palchan* nallah, obviates the necessity for two bridges. Two bridges, one at *Nakhair*, the other near *Baijnáth*, on the road from *Pálapúr* to *Mandí* and *Kullú*, were restored.

Gurdáspúr.

181. The roads from *Gurdáspúr* to *Bahrámpúr* and *Trimmú* were bridged; and the roads to *Basaoli* and *Ghází-kót*, and the *Sháhpúr* and *Sujánpúr* road, were raised.

Siálkót.

182. Three bridges and three metalled gaps were constructed on the *Siálkót* District portion of the road from *Siálkót* to *Amritsar*. The *Beyah* and *Degh* nallahs remain to be bridged. A bridge was completed over the *Buddi* nallah, on the direct road to *Lahore* viâ *Doday*; a new bridge was built at *Wirsálki*, on the *Siálkót* and *Gurdáspúr* road; and a bridge and seven metalled gaps were constructed on the roads leading to *Jammú* and *Waztrábád*, and on other district roads.

Montgomery.

183. In the *Montgomery* District, the improvement of the road from *Chíchawatni* viâ *Kamália* to *Jhang* was completed, and materials were collected for bridging it. Tahsíl boundary roads were constructed between the *Montgomery* and *Gugairah* Tahsíls.

Multán.

184. The road from *Multán* to *Baháwalpúr* was bridged, and otherwise improved; 27 masonry culverts were built along it during the year; and 25 bridges, and 10 out of 53 miles of road, remained to complete. On the *Multán* and *Kehror* road, 20 out of 28 bridges were built. A new unmetalled road was made from the *Channú* Railway Station to *Pakká Mían*.

## COMMUNICATIONS.

185. The road from *Muzaffargarh* towards *Rangpūr* was bridged in several places. *Muzaffargarh.*
186. Further progress was made in constructing bridges and syphon drains on the *Derah Ghāzī Khān* and *Mithankōt* road. *Derāh Ghāzī Khān.*
187. Progress was made in constructing a bridge near *Eminābād*, in the *Gujránwāla* District, and in two metalled gaps near *Mandialā*. *Gujránwāla.*
188. The raising and metalling of the road from *Gujrāt* to the *Kulowāl* ferry was proceeded with. *Gujrāt.*
189. The raising and bridging of the *Dharia* section of the *Jhelam* and *Pind Dādan Khān* road was completed, excepting two bridges at *Hasanpūr* and *Dharia*. *Jhelam.*
190. Two bridges were built on the *Sodī* and *Sakesar* road, and one at *Chohāl* near *Chiniōt*; materials were collected for a bridge at *Talābwāla*, on the *Kathwāl* and *Sodhī* road; three bridges were erected over inundation canals crossing district roads; and mile-stones along the road from the *Shāhpūr* Civil Station to *Sāiwāl*. *Shāhpūr.*
191. Masonry bridges and culverts were built on the roads from *Bāwalpindi* to *Shalditta*, *Sydpūr*, and *Nūrpūr*. *Bāwalpindi.*
192. Two bridges and some culverts were built on the road from *Bannū* to *Lakkī*, and between *I'sā Khel* and *Lakkī*. *Bannū.*
193. Several district roads in the *Peshāwar* District were bridged. *Peshāwar.*

*Bridges.*

194. The abutments and piers of the bridge over the Western Jamnā Canal, on the *Ambālah* and *Jagādhri Road*, were built up to level of wall-plates. The four wells for foundations of the ghāt steps were in progress, and materials were collected for the superstructure of the bridge. *Ambālah to Jagādhri.*
195. The *Tāngri* and *Umlah* crossings were entirely destroyed by the floods, but they were renewed during the year. Two wooden bridges in miles 112 and 114 have been repaired. *Dehli and Ambālah.*
196. The bridge on sixth mile of the *Ambālah* and *Kālkā Road* was completed. *Ambālah and Kālkā Road.*

## COMMUNICATIONS.

**Kálká and Simla**  
(old) Road. 197. A great rise in the stream of the Gambar river, near *Harripur*, on the old road from *Kálká* to *Simla*, did extensive damage to the iron suspension bridge spanning the stream. The bridge was entirely reconstructed during the year, and a curtain wall commenced in front of the right abutment.

Trunk Road between  
Jálandhar and  
Amritsar. 198. The masonry bridge over the *West Beyn* river was completed.

Kángra Valley Road. 199. On the *Bandarghat* and *Bajndth* section, the *Boneyr* bridge, 140 feet span of brick, was completed, as well as its right approach. The *Kholi* bridge of 40 feet span was also completed.

200. On the *Nurpur* and *Bandarghat* section, work on the *Dehri* bridge of timber was completed, with exception of a small portion of the masonry in abutments. A bridge over the *Braal* stream was commenced, and a large quantity of materials collected.

201. The *Bhalli* bridge, 60 feet, with its approaches, which required heavy cutting in rock, was finished. A bridge over the *Seon* stream, three spans of 28 feet, was commenced, and made fair progress.

Ráwalpindi and  
Murree Road. 202. On the hill portion of the road from *Ráwalpindi* to *Murree*, further progress was made with the construction of masonry bridges, in lieu of the former temporary wooden structures. Two of the masonry bridges were completed.

Murree and Kashmir  
Road. 203. The iron suspension bridge over the *Jhelam* at *Kohála*, between British and Kashmir territory, was brought to completion, and the painting only remained to be done, with finishing up of approaches.

Abbottabad and  
Murree Road. 204. The *Jába* bridge on the Murree and Abbottabad Road was nearly completed during the year, and it has since been opened for traffic.

*Boat Bridges and Ferries.*

Trunk Road between  
Jálandhar and  
Amritsar. 205. Consequent on the injury to the Railway bridge over the *Biás* river, the bridge of boats was again constructed, and maintained during the year.

Kángra. 206. The approaches to the *Gopipur Dehra* boat bridge and ferry were improved ; and some rocks near the *Sujanpur* ferry, which endangered boats, were destroyed by blasting.



- |  | COMMUNICATIONS.        |
|--|------------------------|
| 207. Additional superstructure was provided for the boat bridge over the <i>Rávi</i> near <i>Shahderah</i> , and the second roadway completed.   | Sháhderah near Lahore. |
| 208. A boat bridge was established at Chíchawátni on the <i>Rávi</i> , in <i>Montgomery</i> District.  | Montgomery.            |
| 209. Improved approaches were made to all the ferries in the <i>Mullán</i> District.   | Mullán.                |
| 210. Huts were constructed for the ferry police in the <i>Muzaffargarh</i> District.   | Muzaffargarh.          |
| 211. The superstructure of the <i>Waztrábád</i> boat bridge of the new pattern was completed.  | Gujrát.                |
| 212. Cable and smiths' stores godowns were constructed for the <i>Jhelam</i> boat bridge, and accommodation was provided for the bridge Superintendent.  | Jhelam.                |
| 213. The boat bridges over the <i>Satlaj</i> near <i>Fírozpur</i> ; over the <i>Chináb</i> at <i>Waztrábád</i> ; and over the <i>Jhelam</i> at <i>Jhelam</i> , and over the same river at <i>Pind Dádan Khán</i> ; over the <i>Indus</i> at <i>Attok</i> , and over the <i>Kábal</i> river at <i>Naushehra</i> , were repaired and maintained. | Boat-bridges.          |

#### *River Improvements.*

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|---|--------------------|
| 214. During the hot months the Upper Indus Conservancy establishment was employed at <i>Derah Ismail Khán</i> in miscellaneous repair work and preparations for the work of the cold season, painting and refitting the conservancy boats, &c. The establishment was reduced during this interval.  | Indus Conservancy. |
| 215. In October, after the fall of the river, operations for the removal of snags and other obstructions were resumed near <i>Kálabágh</i> . Between <i>Kót</i> and <i>Rokri</i> , a large pipal tree, 48 feet in length, and 13 feet in girth, in a dangerous position in the stream, was blasted and removed, and over a hundred maunds of wood were obtained from it. Altogether between <i>Rokri</i> and <i>Naushehra</i> , below <i>Derah Ghází Khán</i> , 174 snags and 95 trees were removed, as also the brick-work of a large well between <i>Par-ka-basti</i> and <i>Derah Ghází Khán</i> . |                    |
| 216. Nearly 300 maunds of fire-wood were collected from the snags and trees removed. Of this quantity, the Steamer " <i>Biás</i> " consumed 220 maunds, and the remainder was sold by public auction at <i>Derah Ismail Khán</i> .  |                    |
| 217. The banks of the Indus during this season were washed away at various points to a great extent.  |                    |

## COMMUNICATIONS.

*Accommodation for Travellers.*

- Gurgáon.** 218. Improvements were made to the *Gurgáon* staging bungalow and to the *Taorú* rest-house ; and further progress was made in the new sarái at *Rewarí*.
- Rohtak.** 219. A rest-house for native travellers was built at the *Ladwala* tank at *Rohtak*.
- Sirsa.** 220. Progress was made in constructing the sarái, supply house, and well at the *Narail* encamping ground, on the new line of road from Sirsa to Fatehabád, in the *Hissar* District. The sarái at *Fázilká* was completed.
- Jálandhar.** 221. Rest-houses were built at Ráhon and Philour, in the *Jálandhar* District, partly for the use of Civil Officers on tours.
- Hoshiárpúr.** 222. A retaining wall was built for the security of the *Barwain* staging bungalow, in the *Hoshiárpúr* District ; and a sarái at *Burratalí*, on the *Srí Gobindpúr* road, and a rest-house at *Pindoyah*, were in progress, but not quite complete at the close of the year.
- Kángra.** 223. Repairs and improvements were made to the *Dharmśálah* and *Núrpúr* dák bungalows, which have been reopened for public accommodation.
224. Two rest-houses were constructed at Nanglour and Dillas, in the *Kángra* District, on the road from *Kullú* to *Simla*.
- Gurdáspúr.** 225. The new sarái at Fatehgarh, in the *Gurdáspúr* District, was completed ; a fourth portion of a new sarái was constructed at *Dínanagar*, near the town, the former one being far away ; a supply house was built at the *Dhar* encamping ground, on the road from *Pathánkót* to *Dalhousie*, and additions were made to the accommodation at *Dunera*, on the same road, and at *Mádhopúr*.
- Sialkót.** 226. A dák bungalow, containing two sets of rooms, with necessary out-offices, &c., was constructed at Shakargarh, on the *Sialkót* and *Pathánkót* road. A sarái for travellers was also commenced at *Mandiálí*.
227. The sarái at Samriál, on the road from *Sialkót* to *Wazirábád*, was completed, excepting a cattle enclosure ; a new sarái was in progress at Phalora, on the road to *Gurdáspúr* ; covers were supplied to wells at encamping grounds not formerly covered ; materials were collected for a rest-house, partly for Civil Officers on tours, at *Phoklyan*.

228. A sarái was in progress at Koh-i-Karáná, in *Jhang* District, for pilgrims, and also for travellers to *Shahpúr*; additions were made to the rest-houses at Barána and Bokhárf; and a tank was constructed at Toba Tek Singh. COMMUNICATIONS.  
Jhang.
229. The rest-house at Sarái Siddú, in *Multan* District, was completed; and new rest-houses were built at *Koreishi*, and *Makhdúm Rashíd*. Multán.
230. Additions and alterations were in progress to rest-houses at Langar sarái, on the road from *Muzaffargarh* to *Derah Ismail Khan* and at Shahr Sultán, on the road to *Alipur*. Muzaffargarh.
231. A sarái and well were built at Pániala, on the road to Sheikh Buddín, in the *Derah Ismail Khan* District, a rest-house at Bahal on the road to *Multan*, and a pakká tank at Hatala; and the Hatala staging bungalow was enlarged. Deráh Ismail Khán.
232. A new staging bungalow at Sháh Sadrdín, in lieu of one proposed originally at Pír Adil, and a new sarái and well for pilgrims and others at Sakhi Sarwar, in the *Derah Ghazi Khan* District, were in progress. A small sarái was built at Amdání, a rest-house at Kót Chúta, and two wells at Mandráni and Muhammadpúr. Deráh Ghází Khán.
233. The European travellers' quarters in the sarái at Saroke, in the *Gujranwala* District, were rebuilt. Gujránwála.
234. The Khárián sarái, and the European quarters in the Dingah sarái, in the *Gujrat* District, were re-roofed,—the roofs having been destroyed by white ants. Gujrát.
235. The district bungalow at Choya Saidan Sháh, in the *Jhelam* District, was improved and re-roofed; the water-supply at the Chakowál encamping ground was increased; and moveable wooden latrines were supplied to encamping grounds on the Trunk Road, and wooden covers to wells. Jhelam.
236. European travellers' rooms were added to the sarái at Badsháhpúr, and additions were made to the European travellers' room in the sarái at Miání, to the bungalow at Sakesar, and to the sarái at Sáhíwál, in the *Shahpur* District. A kachá tank was constructed between Khusháb and Nura-wála. Sháhpúr.
237. The sarái at Hazro, in the *Rawalpindi* District, was completed; the Dewal staging bungalow, on the road to Kashmir, was enlarged; a well was built for the Ráwalpindi staging bungalow, and a supply-house at the Bárakáo encamping ground on the road to Murree. Ráwalpindi.

COMMUNICATIONS.  
 Hazára.

238. The new dák bungalow at Harripúr, in *Hazára*, commenced in the previous year, was completed.

239. A new encamping ground has been laid out at Chambá, near the Dorh, on the Trunk Road through Hazára; and a new sarái, &c., on it, were nearly completed during the year. A rest-house was constructed at Bagnetar, on the road from Abbottabád to Murree, and a portion of the Abbottabád sarái was re-built.

Bannú.

240. A new staging bungalow was built at Lakkí, on the right bank of the Gambelá, in the *Bannu* District; out-houses were supplied to the Edwardesabád staging bungalow, and additions were made to the staging bungalow at Pezú.

Kohát.

241. New saráis were in progress at Ustarzáf and Súrozaf, on the main road between Kohát and Kúram.

242. Fourteen ferries with boat bridges, 330 ferries without boat bridges, and 19,662 miles of district roads, besides staging bungalows, sariás and encamping grounds, in different parts of the country, have been maintained by the Civil Officers.

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MISCELLANEOUS PUBLIC IMPROVEMENTS.

MIS. PUB. IMPTS.  
 Dehli.

243. The memorial monument on the ridge at *Dehli* was completed.

Gurdáspúr.

244. Certain works for the protection of the town of Derah Baba Nanak from the encroachments of the river Rávi were completed. A large extent of land was reclaimed. Further encroachments are requiring additions to these works this year.

Amritsar.

245. The clock-tower in the city of *Amritsar* was finished all but the exterior decorations and the fitting up of the clock.

Lahore.

246. The tomb of Ranjít Singh, at *Lahore*, was repaired at the expense of the State.

Pind Dádan Khán.

247. Materials were collected for protective works at the Khewra gorge, in the Salt Range, and the works were commenced. The tank near Pidh was stanchd and deepened.

Gurgáon.

248. In the *Gurgáon* District, compensation was paid for property taken up to enlarge the bazár of Rewári, for a paccá road at Farakhnagar, and for various purposes in Palwal and other towns; and a paccá road was constructed in Fíroz-pár Jhirkí.

249. A town-hall or Committee house was built at Hissar ; the drainage of this town was improved ; and a new public necessary and four conservancy carts were constructed : the trench system was introduced instead of deep pits heretofore used. Pavements were substituted for metalling at crossings where there is much traffic in *Bhewani*. A paccá ghát or landing was constructed at a tank at *Shah Balol*, where the annual cattle fair is held.

Mis. Pub. Impts.  
Hissar.

250. Main streets of Jhajjar and Bahádurgarh, in *Rohtak* District, were paved and metalled, and latrines were constructed at Beri. The shaft of an old well at *Rohtak*, which had become dry by the sinking of the water level, was carried further down.

Rohtak.

251. At Sirsa, three gháts were built at the Bahadura tank, some drainage work was executed, and a mound lying between the town and the Fort ruins was cleared, and a road made through it. Town roads at Fázilká were metalled, a tank was excavated, and six wells were constructed. Some of these works had to be undertaken, in lieu of others, to afford relief to sufferers from the famine.

Sirsa.

252. Bonded warehouses and public necessities were constructed, and town roads improved, at Farídábád and Balabgarh, in *Dehli* District.

Dehli.

253. Streets of the towns of Pánípat and Kythal were paved, and some drainage work was executed at *Karnál*.

Karnál.

254. Streets were paved in Jagádhri, Thánesar, Rúpar, and six other towns of the *Ambálah* District ; improvements were made to tanks at *Ambálah* and *Morinda* ; a new paccá well was constructed at *Ambálah* ; three wells in the bed of the *Tangra* were connected ; and the drainage of *Ambálah* and *Radour* was improved.

Ambálah.

255. The Municipal Committee house at *Ludiánah* was nearly completed ; streets of the town were metalled, and the sewerage improved ; and improvements were made to streets and drainage of Machíwara, Raikót, and Khanna. A godown and well were constructed in the *Ludiánah* public garden.

Ludiánah.

256. New pavements were laid down in Jálandhar, Kartárpúr, Adampúr, Philour, Nakodar, and four other towns of the Jálandhar District.

Jálandhar.

257. New public necessities were built at four towns in the Hoshiárpúr District.

Hoshiárpúr.

MIS. PUB. IMPTS.  
Kángra.

258. New latrines and pavements were constructed at Kángra, Núrpúr, Kullú, and Harrípúr, and warehouses at Sujánpúr and Gangta.

Gurdáspúr.

259. Some improvements were made to the *Gurdáspúr* public garden; three town halls or meeting houses for the Municipal Committees were built at Batálah, Bahrampúr, and Sujánpúr; a new public necessary was built at Batálah; and streets of the numerous towns of the district were paved, drained, and bridged.

Siálkót.

260. Materials were collected for the conversion of an old unsightly tank near the *Siálkót* Kácherí into a pacca tank,—the work to be executed from private subscriptions which have been collected. Streets of Siálkót, Pasrúr, Zafarwál, and other towns, were paved; pacca pavements were supplied round the mouth of wells, and two new latrines were constructed at Siálkót.

Amritsar.

261. At *Amritsar*, further progress was made in the renovation of the Rambagh as a public garden and pleasure ground; an outlet was made to the Santoksar tank in the city, and masonry crossings over the main drain outside the Khazana and Hakíman gates.

Fírozpúr.

262. The *Fírozpúr* town-hall was nearly completed; a new northern gate of the town of Zirah was constructed; and materials were collected for a masonry tank at Dharmkót. The large masonry tank at Moga, on the Trunk Road between Fírozpúr and Ludiánah, was completed, a fifth of the expenditure being met from Local funds, a tenth, or Rs. 1,000, being contributed by the Mahárájah of Pattíalah, and the remainder obtained by private subscriptions in the neighbourhood. A Municipal Committee meeting house and two gates were built for the town of Muktsar, and materials were collected for paving the bazár of the town. A part of the Fírozpúr circular road was metalled, and new latrines for this town were constructed; and improvements were made to the entrances, pavements, &c., of three other towns of the district.

Montgomery.

263. The drainage and station roads of *Montgomery* were improved; a bonded warehouse was constructed at Pák Patan, and a Committee house at Kamálah.

Jhang.

264. Four enclosed bathing places for women were built at Jhang and Maghiánah; lamp-posts with masonry supports were erected along the road between the two towns; latrines were constructed at Chiniót.

265. Some of the *Multán* station roads, and roads connecting the town with the cantonment, were metalled, and improvements were made to the station garden; the *Multán* grain market was raised and paved, and some of the main streets of the town were paved. A tank outside the town of Kehror was nearly completed; and progress was made in paving streets of Tulamba, and in various improvements in other towns.

Mrs. Pub. Impts.  
Multán.

266. Bonded warehouses were built at the sadr station and three towns of the *Muzaffargarh* District, and the drainage of towns was improved.

Muzaffargarh.

267. The *Derah Ghází Khán* Municipal Committee's meeting house was completed; 1154 running feet of the main street of the town were paved, and side drains constructed; improved shop-fronts were built for 140 shops, the expense being shared between the municipal funds and the owners; and the market place was improved. A masonry tank was constructed at Dajil; streets were paved and drainage improved at Mithankót and Jampúr; and improvements were made to the market place at Jampúr.

Derah Ghází Khán.

268. The brick pavement of the main streets of the town of *Derah Ismail Khán*, and the metalling of the road round the town, were continued; the town wall was lowered. Two latrines were constructed at Bhakkar.

Derah Ismail Khán.

269. An unsightly hollow near the *Gujránwála* Jail was filled up; progress was made in paving streets in *Gujránwála* and *Wazírábád*, and in improving the drainage and other works of these and other towns in this district.

Gujránwála.

270. Bridges were constructed and streets paved in towns of the *Gujrát* District.

Gujrát.

271. Latrines were constructed at *Jhelam*; the drainage of the town towards the river was improved; and kankar was collected for metalling station roads. Streets at Pind Dádan Khán and other towns were paved. A bund was made to protect the town of Talagang; and tanks were dug at *Jhelam* and Chakowál.

Jhelam.

272. Further progress was made in metalling the *Sháhpúr* sadr station roads; streets of the town of Bherah were paved, and its circular road was bridged; a gateway was built at Miání; and streets of Sáíwal and Khusháb were paved and bridged.

Sháhpúr.

MIS. PUB. IMPTS.  
Ráwalpindi.

273. Excavations for antiquities were continued at Sháh ki-Derí, in the *Ráwalpindi* District, and a few old Greek coins were discovered.

274. The new road connecting the *Ráwalpindi* Civil Lines with the Cantonment, and the circular road round the back of the town, were metalled. A meeting house was built for the *Ráwalpindi* Municipal Committee, and two new latrines and some paving were executed in the Talianwala bazár.

Bannú.

275. Part of the station road at Edwardesabád, in the *Bannú* District, was metalled; three latrines were built; materials were collected for paving main streets of the town; the drainage of the town was improved. A bund was constructed at I'sá Khel.

Pesháwar.

276. About 11,000 running feet of masonry saucer drains were constructed in different quarters of the city of *Pesháwar*.

Outlay by private  
persons on Public  
Works.

277. Besides the above, the undermentioned works were constructed by private persons at their own expense for the benefit of the public—

55 wells, of which 27 were in the *Amritsar*, and 12 in the *Jhelam* District.

3 tanks,

5 dharmasálahs or rest-houses.

3 sariás: one at Jání-ke-Sang, in the *Rawalpindi* District, built by Suján Singh and Makhan Singh, which had been for a long time in progress, is estimated to have cost Rs. 30,000.

Tanks and Wells.

278. Improvements were made to tanks at three localities in the *Ambálah* District. Grants of money were given to zamíndárs in aid of the construction of eight wells and seven reserviors in hilly tracts of the *Hoshiárpúr* District, in continuation of outlay of previous years.

Arboriculture.

279. About 11½ lakhs of trees were planted out along roadsides and at encamping grounds, in the *Hissár*, *Rohtak*, *Sirsa*, *Ludiánah*, *Kángra*, *Amritsar*, *Sidálkót*, *Ferozpúr*, *Multán*, *Jhang*, *Gujrát*, *Jhelam*, *Sháh-púr*, *Ráwalpindi*, *Pesháwar*, *Derah Ismail Khán*, and *Derah Gházi Khán* Districts.



## AGRICULTURAL.

280. On the open portions of this canal the work of the year consisted chiefly of repairs, silt clearances, &c.

281. *Original Works.*—The surveys of the boundaries of the canal lands were completed; the plans for record and the erection of boundary pillars in progress.

282. *Repairs.*—The floods in the Rávi during the rainy season of this year were of unprecedented magnitude. At the head of the canal the water rose three feet above the highest yet recorded, and at the foot of the low hills, five miles above the heads, one foot above the highest known water mark.

283. This flood occurred on the 23rd July. An immense quantity of timber came down the river, as in a similar flood in 1869, completely blocking up the canal head for some days. A few logs found their way into the canal, and damaged four of the boulder rapids. The old head-works stood well, the only injuries being the carrying away of a portion of one of the dam piers, and breaking of one of the new sluice gates. The canal was closed for 15 days from the 23rd July to 8th August for the execution of the necessary repairs. The cause of the damage, being so slight compared with that resulting from the floods of 1869, which were not so high, was the short duration of this flood. In 1869, the water remained at a high level for 48 hours, while the last fell in six hours.

284. On the 15th August, a very high flood passed down the Chakkí torrent, and through the artificial cutting in the Dhangú hill. The cut has, however, deepened so much in the course of the last few years that little injury resulted, a very small quantity of water escaping down the old course, which the cut was intended to supersede.

285. On the 9th August, a flood occurred in the Biás river such as has not been known for 25 years. The embankments for the protection of the low portion of its valley, locally termed the Kánowán Chamb, were topped, and a large portion undermined and carried away. Design and estimate for diverting the main stream of the river, and repairing and strengthening the embankments, were prepared, and the work has since been put in hand.

286. In the month of December the volume of water in the Rávi at the canal heads fell lower than in any previous year except 1868-69.

287. The cold season rain commenced in January, and the consequent floods in the Rávi were more numerous and troublesome than in any year of which records exist. Three occurred in each of the months of January, February, and March, necessitating an unusually heavy outlay in maintaining

## AGRICULTURAL.

## ORIGINAL WORKS.

*Bári Doób Canal.*  
1st Division.

AGRICULTURAL.  
ORIGINAL WORKS.  
*Bárí Dodó Canal.*

the canal supply; one flood following another at short intervals rendered it most difficult to keep the temporary head bunds in proper working order, which was absolutely necessary, in order to supply the irrigation in the lower districts where rain fell but scantily.

288. The canal was closed for the annual repairs and clearance for 26 days in January. The boulder and shingle deposit at the canal head, brought down by the floods in the rainy season, was partially removed, and the repairs to works commenced during the July closure completed. The bed and works in the sandy tract, where erosion has taken place, were found to be in fair order.

2nd Division.

289. *Original Works.*—A masonry weir, costing Rs. 2,408, was constructed across the Vahn escape to stop the erosion of bed which endangered the foundations of the Railway bridge crossing the channel a short distance above, as well as to raise the level of the water passing down the escape with the view of utilizing it for irrigation.

290. The demarcation of the canal lands, with the exception of a few disputed portions, was completed.

291. The whole number of earthen pipes for irrigation outlets were completed, and of the entire number of outlets required (7,515), 3,439 have been laid.

292. The superiority of these pipes to the old wooden tubes is already evident in the security they afford against fraudulent alteration of the dimensions, and facility of regulating the supply to the several cultivators.

293. *Repairs.*—No silt clearance was effected from the canal bed. Distributaries were cleared as far as funds were available.

294. The expenditure on plantations was in the—

	Rs.
1st Division ... ..	2,125
2nd Division ... ..	3,356

on the maintenance of existing lines, nurseries, and groves of trees.

3rd Division.

295. Comprises the Kasúr and Sobráon Branches under construction. All expenditure debitable to loan funds.

296. At the close of the previous year, the excavation was in progress on—

50 miles of the Kasúr Branch,  
40 do. Sobráon "

The total lengths being—

Kasúr Branch ... ..	90 miles.
Sobráon do. ... ..	67 "

At the close of the year under review, the state of the excavation was as follows:—

Kasúr Branch ... ..	50 miles completed.
Sobráon " ... ..	{ 88½ do. do.
	{ 4½ in progress.

The quantities excavated during the year were on the—

					Cubic feet.
Kasúr Branch	...	...	...	...	23,553,900
Sobráon „	...	...	...	...	30,524,194
Total	...	...	...	...	54,078,094

AGRICULTURAL.  
ORIGINAL WORKS.  
*Bári Doáb Canal.*

The remaining lengths of the channels are of small section, so that a comparatively small quantity of excavation remains to complete. The alignments of both channels towards their extremities have been determined after a very careful examination of the country, and will be marked off very shortly.

297. The quantities of materials collected or manufactured during the year are approximately as follow :—

Bricks	...	...	...	1,781,500
Stone-lime	...	...	...	11,955 cubic feet.
Kankar for lime	...	...	...	53,400 do.
Charcoal	...	...	...	6,028 maunds.

The manufacture of bricks at reasonable rates being mainly dependent on the supply of fuel procurable, it has been and is carried on at many points scattered over a long line of country, so that some delay has occurred in collecting the required quantity at the site of each masonry work. Sufficient, however, has now been massed at some of the sites, and the works will be put in hand at the commencement of the cold weather. Meantime, one of the Sub-divisional head-quarter chaukís has been all but finished, and the working plans for the falls and other masonry works are in a forward state.

298. The contour levels for determining the alignments of the distributaries on both branches are complete. The lengths levelled during the year were on the—

Kasúr Branch	...	...	...	...	457 miles.
Sobráon „	...	...	...	...	491 „

Lengths of distributaries and canal terminations levelled were—

Kasúr Branch	...	...	...	...	189 miles.
Sobráon „	...	...	...	...	120 „

299. In this Division is included the masonry dam across the Rávi and head-works, as well as the works connecting with the general remodelling and completion of the existing canal channels.

Special Works Division.

300. *Rávi dam.*—The remaining portion of this work which was unfinished at the close of the previous year, was completed before the advent of the rainy season, with the exception of some protective work down-stream in the deep channel. The extraordinary floods in the river, elsewhere mentioned, breached it in a few places, but the fissures thus made were all of small width ; on the whole, the work stood well spite of the want of the protective talus, and a large portion of the masonry in the deep channel not having had time to indurate. The piers of the escape sluices and of the canal inlet were all more or less damaged by the timbers

AGRICULTURAL.  
ORIGINAL WORKS.  
*Bárá Dobb Canal.*

brought down by the floods, some altogether carried away. Repairs to the breached portions were commenced in November, and completed in January. This work being the first of the kind attempted in the boulder bed of a river in Northern India, the experience gained in a year of unprecedented floods, as this was, will be of much value in designing other similar works elsewhere, which are now under consideration. It was evident that some alterations were necessary in the general design and detail of the work. A revised design and estimate was consequently prepared, which has since been sanctioned, and so much of it as might possibly be completed before the setting in of the rainy season was put in hand. By the close of the year, the masonry of the canal inlet on the new design, consisting of a series of arched openings, was complete. The isolated piers of the old design, it was clearly proved, could not withstand the impact of the logs brought down in such quantities in high floods. Some bunds and other works for training the river above the dam were in progress; the alterations to the body of the dam will be commenced immediately on the close of the next rainy season.

301. *Remodelling canal channels.*—A large quantity of materials were landed at the sites of the new masonry works. A sufficient number of bricks to admit of commencing the works has now been collected at some of the sites. The working plans of the new falls are nearly complete.

302. Surveys were carried out for determining the alignment of new distributaries to utilize the spare water at the tail of the Lahore Branch and elsewhere, and for the navigable communication between Lahore and the Satlaj. The detailed designs and estimates for these, and the whole of the works required for the completion of the Bárá Doáb Canal system, have been partially completed, and will, it is expected, be finished in the course of a few months.

303. A series of experiments have been carried out on the manufacture of artificial stone or concrete blocks, with the view of substituting them for brick in positions exposed to the action of running water.

Mádhopúr Work-  
shops.

304. The question of the maintenance of these workshops was again under discussion during the year. It was decided to reduce them to a size sufficient for the requirements of the canal works only. Revised design and estimate was prepared, and has since been submitted for sanction.

305. The quantities of the two heaviest descriptions of work turned out during the year were—

Castings	...	...	...	...	856 maunds.
Wrought-iron work	...	...	...	...	474 "

The outturn was better than in the previous year, though it was not until September that the order to charge market rates began to take effect in drawing custom to the shops. Until the machinery, however, is put in proper working order, and the proposed arrangements completed, the shops cannot perform full duty, or be a financial success.

AGRICULTURAL.  
*Bári Doab Canal.*

306. These are the series of inundation canals from the Rivers *Satlaj* and *Chináb*, in the *Multán* District.

Lower *Satlaj* and  
*Chináb* Canals.

307. *Original Works*.—Six inspection houses, nearly finished at the close of the previous year, were completed.

308. *Repairs*.—The annual silt clearances, which form the greater portion of the work on these canals, were carried out as usual by statute labor.

309. New supply heads from the rivers were excavated for five of the canals.

310. The embankment along the *Chináb* river above the city and station of *Multán* withstood the floods successfully. Few repairs were required.

311. Inundation canals from the right bank of the *Satlaj*, in the *Lahore* and *Montgomery* Districts.

Upper *Satlaj* Canals.

312. No work during the year, except the usual repairs and clearances.

313. A new supply head,  $5\frac{1}{2}$  miles in length, was excavated for the *Upper Sohág Canal*.

314. The demarcation and registry of the canal lands was in progress throughout the year. About three-fourths of the boundaries were marked off, and the register of the lands completed.

315. The supply heads to the *Katora* and *Khánwah Canals*, commenced in the previous year, were completed.

316. Designs for distributaries from the *Katora Canal* were in hand.

317. The complete scheme for the irrigation of the Lower *Bári Doáb*, and a portion of the country on the opposite bank of the *Satlaj*, alluded to in last year's report, was submitted to Government in January 1872.

Special Survey Division,  
Lower *Bári Doáb*.

318. The area of country affected by this project is as follows :—

	Square miles.
On right bank of <i>Satlaj</i> , in the <i>Bári Doáb</i> ...	7,800
„ left bank ditto, ditto ...	3,200
Total ...	11,000

Of the area on the left bank, 2,200 square miles are in the Native State of *Baháwalpúr*.

AGRICULTURAL.  
*Bári Doáb Canal.*

319. The aggregate length of channels estimated for is—

On right bank of Satlaj	...	...	1,143½ miles.
„ left bank (not including Baháwalpúr)	...	...	83 „
Total	...	...	1,226½ „

The available supply of water is estimated at—

Rabbi	...	...	5,000 cubic feet per second.
Kharif	...	...	10,000 ditto ditto.

of which the quantities allotted to Baháwalpúr are—

Rabbi	...	...	1,000 cubic feet per second.
Kharif	...	...	2,600 ditto ditto.

320. The areas of irrigation for British territory are calculated—

In the rabbi	...	...	720,000 acres.
„ kharif	...	...	444,000 „

321. The total estimated outlay amounts to Rs. 3,56,07,859, of which Rs. 63,30,569 is the cost of the dam across the *Satlaj*, with head works.

322. The proportions debitable to each State are as follow :—

					Rs.
British	...	...	...	...	3,60,76,938
Baháwalpúr	...	...	...	...	39,66,613

323. The net return on the outlay is calculated at 10½ per cent.

324. During the year further explorations and surveys of the country were carried out, to determine the alignments of supply heads from the Rivers *Satlaj* and *Bári* into some of the old nallahs, with the view of utilizing them as ordinary inundation canals, until the *Satlaj* dam is completed, or in case that project is not carried out.

325. The designs and estimates for this alternative scheme are being drawn up.

326. In the month of July, the flood discharge of the *Satlaj*, at proposed site of the dam, was measured ; the result was the largest yet recorded.

*Derájt Circle.*  
*Derah Ghází Khán*  
*Canals.*

327. This is the series of *Inundation Canals* in the *Derah Ghází Khán* District between the Indus and the Sulemán range of hills.

328. *Original works.*—The 1st and 2nd class inspection houses, in progress at the close of last year, were completed.

329. *Repairs.*—The floods in the *Indus*, as in almost all the Panjáb rivers, were unusually high. The heavy rain in the adjoining range of hills caused floods in the torrents also of extraordinary magnitude. The *Kála* embankment along the river, north of *Derah Ghází Khán*, was breached in several places by the latter floods, the first occasion of breaches from this cause. Fortunately, however, the set of the river was not on this portion of the embank-

ment; the river flood did not in consequence find its way through the breaches.

AGRICULTURAL.

*Derajat Circle.*

330. Opposite the station of *Derah Ghází Khán*, the river embankment, locally called the *Bahár Sháh Bund*, was all but carried away, the deep stream of the river having set in here, and eroded the bank to within a few feet of the bund. A new protective embankment at a safe distance to the rear,  $4\frac{3}{4}$  miles in length, was commenced before the close of the year, and has since been completed.

331. At the *Sháh Jámál* embankment, 30 miles south of the town of *Derah Ghází Khán*, a protective embankment in rear of the old work was completed before the commencement of the rains. A high flood on the 22nd June, however, carried away a large portion of both old and new bunds; the result was extensive inundation and consequent damage to cultivation. A new bund, about  $3\frac{1}{2}$  miles in length, in rear of the old one, estimated to cost Rs. 27,000, was nearly completed by the close of the year. Every precaution has been taken in its alignment and construction which the experience of past years has suggested; but spite of every care in construction and subsequent supervision, works of this nature must always be exposed to risk where the rivers are so constantly shifting, and the soil so treacherous.

332. New supply heads were excavated for seven of the canals. The expenditure on this item has been unusually heavy, owing to changes in the river beds.

333. The annual silt clearances extended over 450 miles of channel; the aggregate outlay being Rs. 84,223.

334. The project, alluded to in last year's report for improving and extending irrigation in the *Derah Ghází Khán* District, was completed by the end of the hot season, but the aggregate estimated outlay being larger than it was thought possible to obtain a remunerative return on, the designs have been revised, and fresh estimates are now being drawn up.

*Derajat Special Survey Division.*

335. Surveys and exploration of ground were carried out to obtain data for a design for the economical distribution of the flood water from one or two of the hill torrents.

336. Surveys and levels were completed of the *Indus* and adjoining country, where the river debouches from the Salt Range into the plains at *Kálábágh*, with the view of determining the feasibility of drawing off a supply of water for the irrigation of the *Sindh Saugar Doáb*, or the tract lying between the Rivers *Indus* and the *Jhelam* and *Chináb*.

337. The river at and above *Kálábágh* runs in a well defined rocky or boulder channel with a moderate velocity, except in high floods, and a depth when at the lowest of 35 to 40 feet. No dam across the river would be required to

## AGRICULTURAL.

*Derájút Circle.*

secure the supply to a canal taken off here. The difficulties in leading water from this point on to the plains of the Doáb all lie in the first 28 miles, below which there are no obstructions whatever. Sufficient data were collected by the close of the year for designing a channel along these 28 miles, and a few cross sections were carried across the Doáb lower down to indicate the probable direction of branch canals. The sole drawback to this project is the deficiency of population at present in the tracts in question. Land there is in abundance only needing water, and the supply from the river at all times of the year ample; 8250 square miles are reported as culturable.

338. The length of levels and survey executed during the year were for the *Kálábágh* project—

Levels with survey ...	...	...	...	1,015 miles,
Surveys only ...	...	...	...	126 "
Levels only ...	...	...	...	120 "
Total				1,261 "

For the *Derah Ghází Khán* project—

Levels with survey ...	...	...	...	875 miles.
Surveys only ..	...	...	...	872 "
Levels only ...	...	...	...	83 "
Total				830 "

339. These operations were scattered over the country lying between *Kálábágh* and the boundary of *Sindh*, a distance of about 400 miles.

340. The design and estimate for the channels from *Kálábágh* are now in hand.

## Muzaffargarh Canals.

341. The report on these canals, alluded to in last annual report, was received shortly after the commencement of the year.

342. There are 66 canals in all drawing their supply from the Rivers *Indus* and *Chináb*. Of these, 58 are from the *Indus*, 8 from the *Chináb*; the aggregate length of the former being 428 miles, of the latter 86 miles.

343. The first canal on the *Indus* side takes off from an old channel of the river near *Kót Sultán*, about 13 miles south of the town of *Leia*. The total area of the district affected is about 3022 square miles, of which 1900 square miles are reported to be culturable, and of the latter 646 square miles are actually cultivated. The area irrigated from the canals amounts to about 250,780 acres, or  $\frac{5}{8}$ ths of the cultivated. These canals have hitherto been cleared and kept in repair by statute labor, under the control of the Deputy Commissioner. Improvement of the channels and extension of the irrigation is needed here, as on all the inundation canals of the Province, but the question of the future management is in abeyance, until a decision is come to regarding the *Kálábágh*



scheme above alluded to, which might materially influence the future of these canals by substituting in part at least a permanent for the present uncertain supply of water.

AGRICULTURAL.  
*Swat River Project.*

344. The commencement of field operations in connection with this project was reported in last annual report. The object is to supply irrigation from the *Swat* River to a portion of the *Eusafzat* District, in the *Peshawar* Valley. A preliminary report and rough estimate was submitted in September 1871, on which orders were issued to complete the exploration of the country, and prepare detailed designs and estimates for the actual prosecution of the works.

*Swat River Project.*

345. The present condition of the tract, which would be affected by the proposed canal, is as follows :—

	Acres.
Total area	851,792
Cultivated	212,590
Culturable, not cultivated	71,779
Unculturable	67,424

Of the cultivated area, 27,904 acres are irrigated from inundation canals or wells.

346. There are therefore 256,465 acres, for which water is required.

347. The proposed scheme consists of a main channel  $18\frac{1}{2}$  miles in length, with distributaries aggregating about 121 miles.

348. The available supply of water in the river at the lowest amounts to 2900 cubic feet per second, of which 800 cubic feet would be drawn off. The calculated area of irrigation is as follows :—

	Acres.
Kharif	47,285
Rabbi	94,470
Total	141,705

349. The rough estimate of the outlay required amounted to Rs. 14,50,149; the annual gross income to Rs. 3,07,027; net profit, Rs. 1,88,977, or about 13 per cent. on the capital.

350. A more complete report, received in the month of January last, showed some increase in the figures, thus :—

	Rs.
Total cost	15,27,240
Income	3,30,045
Net balance	2,09,045

351. The resulting profit being about the same as before.

352. The additional field-work required was well advanced by the close of the year, and has since been completed. The length of contour levels executed was about 280 miles.

353. The detailed designs and estimates are now under preparation.

## AGRICULTURAL.

*Sháh-púr Canals.*

354. The tract of country in which these canals are situated lies between the *Jhelam* and *Chináb* rivers. The general declivity of the surface is from north to south, or from the *Jhelam* river in an oblique direction towards the *Chináb*. This, and the circumstance of the level of the stream of the *Jhelam* for a considerable distance from the hills being slightly below that of the adjoining plains, render irrigation from this river comparatively an easy matter. There are 18 inundation canals, large and small, drawn from the *Jhelam* in this district; of these, two, the expenditure on which was formerly defrayed from Local Funds, were purchased by Government in 1870-71. These are now maintained by, and their income credited to, Government, but the management remains with the Deputy Commissioner. The income from the irrigation is here realized by taking a share of the produce. A permanent supply of water might be drawn for the irrigation of this Doáb from the *Jhelam* at the foot of the low hills, but for this reliable data have not yet been obtained.

## Chiniot Canal Project.

355. A rough reconnoissance was made of the River *Chináb* close to the old town of *Chiniot*, in the *Jhang* District, with the view of ascertaining the feasibility of drawing water off there for the irrigation of the lower portion of the *Rechna* Doáb; an isolated ridge of rock crosses the river here, through which the stream passes by two openings of an aggregate width of 1100 feet, while immediately below the breadth of the channel is 3400 feet.

356. The water is thus headed up above the ridge when the river is high, so that a channel might be taken off here at small cost, to which the supply of water would be certain at all seasons of the year.

357. The tract of country south of *Chiniot* which would come under the influence of such a canal is about 180 miles in length by 48 in width, or 3840 square miles in area.

## Western Jamná Canal.

358. The operations in the irrigating divisions of this canal were, with a few exceptions, confined to the maintenance of the existing works and management of the irrigation.

## Karnal Division.

359. The cut across one of the loops in the canal, on the line of the *Ambálah* and *Saháranpúr* road, was excavated as far as possible without closing the canal.

360. The completion of the escape from the *Dehli Branch* bifurcation at *Rair* has been delayed by a bed of *kankar* crossing the channel a few miles from the head, which the quantity of drainage water constantly present renders it

difficult to remove; 22,81,068 cubic feet were excavated during the year. This channel, though not yet brought into use as an escape for the surplus water of the canal, has done good service already in draining the adjoining lands, a large portion of which have thus been lately brought under cultivation.

AGRICULTURAL.  
Western Jamná  
Canal.

361. The demarcation of canal boundaries, with the exception of one rájbahá, was completed by the close of the year.

362. *Repairs.*—The floods in the *Jamná*, though severe, were not so high as have been known in other years; but the magnitude of those in the torrents which converge at the Dádúpúr regulating head was unprecedented. At the regulating head the water rose about  $1\frac{1}{2}$  feet above the highest water mark since the construction of the works in 1833. Two of the dam piers were carried away. These were renewed, and the damages to the other portions of the works repaired.

363. Extraordinary freshets occurred in the *Jamná* in the cold season, as on the Ráví, rendering the maintenance of the canal supply a matter of considerable difficulty.

364. This source of anxiety will be obviated by the construction of the new permanent dam and head-works.

365. The usual silt clearances of distributaries, and repairs to the canal channels, were carried out.

366. Considerable progress was made in demarcating the canal boundaries, which will, it is expected, be completed during the ensuing year.

Dehli Division.

367. The rest of the work in the Division consisted of the usual clearances and repairs, which need not be described in detail.

368. The masonry escape at the *Nandrámpúr* bund, in place of that carried away in 1869, was completed. The other works were ordinary repairs and clearances.

Dehli and Gurgáon  
Division Irrigation  
Works.

369. The demarcation of the canal boundaries in British territory was completed. In the State of Jhínd, the work has been delayed pending the settlement of some disputed points.

Hánsí Division.

370. The other work in the Division consisted of ordinary repairs and clearances.

371. On the new *Hánsí* line, 1,642,050 cubic feet were excavated in the early part of the year, when further progress was stopped pending a decision on the general scheme, which, it was mentioned in last annual report, was submitted for the orders of Government in March 1871.

New Hánsí Branch  
and Special Survey  
Divisions.

## AGRICULTURAL.

*Western Jamná Canal.*

372. An addition of five lakhs of bricks was made to the stock.

373. During the remainder of the year the establishment of this Division, as well as that of the Special Survey, was employed on completing necessary surveys and levels, and preparing plans and estimates, as well as in collecting materials for the dam across the *Jamná*.

374. The orders of Government on the general scheme were received in September, and in the following January the sanction of the Secretary of State to the prosecution of the following portions of it, viz. :—

Jamná dam.  
Distributaries.  
Drainage works.

375. Collection of materials for the dam was commenced in November, on an estimate amounting to Rs. 33,275. The working design and estimate was completed by the close of year, and has been since submitted for the sanction of Government.

376. The progress in collecting materials up to the close of the year under review is reported as follows :—

Boulders	...	...	...	...	285,086 cubic feet.
Lime-stone	...	...	...	...	6,843 "
Fuel...	...	...	...	...	300 maunds.

A careful search for stone and other building materials was carried out in the lower range of the Himalayas, and the plain country in the neighbourhood of the canal works.

377. The remaining contour levels below Karnál were completed.

378. The surveys of the existing distributaries and water-courses were finished, with the exception of a few from the lower portion of the *Hánsi Branch*. This, the most troublesome of the preliminary operations, it was necessary to complete before a single new distributary could be projected. The aggregate length of channels thus surveyed during the year was 2494 miles.

379. An exhaustive exploration of the country about the *Caggar* and *Sarsuttt*, and in the *Hissár* District, was carried out with reference to the possible construction of storage reservoirs. The result is not encouraging. The details are too lengthy to be given in this report.

380. The plans and estimates for the remainder of the works sanctioned were in progress at the close of the year, and would, it was expected, be ready for submission very shortly.

*Sirhind Canal.*

381. The designs and estimates for the branches of this canal were completed in the early part of the year, and the whole was submitted for the orders of Government in the month of February 1872.

382. The total estimated cost of the complete project, including the portion already sanctioned, amounts to Rs. 2,98,04,270, of which the approximate share to be paid by the Native States is Rs. 1,06,22,167, leaving Rs. 1,91,82,103 to be defrayed by the British exchequer.

383. The aggregate length of irrigating lines, a portion of which will be navigable, is  $453\frac{1}{2}$  miles; channels for navigation only  $100\frac{1}{2}$  miles; total length of channels 554 miles. A continuous navigable communication,  $205\frac{1}{2}$  miles in length, is provided for from the Satlaj at Firozpúr to the Western Jamná Canal above Karnál, whence the communication will be continued to the Jamná below Dehli, if the project for improving the Western Jamná Canal channels, above alluded to, be carried out.

384. The volume of water which the channels are calculated to distribute is 3000 cubic feet per second in the winter months, and a maximum of 6000 cubic feet per second in the summer season.

385. The estimated areas of irrigation are as follow, in English acres :—

	On British Branches.	On Native State Branches.	Total.
Summer crop ... ..	190,500	106,500	297,000
Winter „ ... ..	316,800	169,200	486,000
Total ...	507,300	275,700	783,000

Of this the area in—

	Acres.
British territory is ... ..	376,604
Native States ... ..	406,396

Portions of six Native States will be irrigable from the canal, but only three will be sharers with the British Government in the undertaking. Their shares of the cost will be approximately as follows :—

	Rs.
Pattialah ... ..	91,52,070
Jhind ... ..	4,75,620
Nabha ... ..	9,94,477
Total ...	1,06,22,167

The aggregate area of country which will be affected by the projected canals is about 8476 square miles, or 5,424,640 acres. The estimated area irrigable in both seasons, as shown above, is 783,000 acres, from which, deducting one-tenth, the probable area of double cropped land, the proportion of the

AGRICULTURAL.  
Sirhind Canal.

## AGRICULTURAL.

*Sirhind Canal.*

total area protected by the canals will be some thing less than one-seventh.

386. In July 1871, the final orders of the Government of India were issued regarding the terms of the agreement to be made with the above-mentioned Native States, to whom they were shortly after communicated, and their assent is shortly expected.

387. The excavation in the first two Divisions, the only portions yet under construction, proceeded slowly until the month of August, when a large and sudden influx of laborers from the districts to the southward, where a famine was impending from want of rain, enabled the Canal Officers to push on this part of the work at a very rapid rate.

## 1st Division.

388. The progress in this Division was as follows :— The permanent buildings for shelter of the establishment, the temporary building, with the exception of one or two quarters for Upper Subordinates, and the temporary quarters for Clerks, were completed by the close of the year.

389. *Temporary Jails for shelter of prisoners employed on the excavation.*—Sanction was given during the year to an increase in the number of prisoners for whom additional shelter is being provided. Additions to the existing Jail at Rúpar were nearly completed. Considerable progress was made in the construction of a second building, and a third was commenced.

## 390. Excavation—

					Cubic feet.
Total quantity	...	...	...	...	500,000,000
Excavated during year	...	...	...	...	67,789,016
„ up to end of year	...	...	...	...	92,889,016
					Rs.
Expenditure during year	...	...	...	...	2,85,166
Budget grant	...	...	...	...	2,77,500

Of the above, 12,034,773 cubic feet were excavated in diversion cuts, the remainder in the canal channel. The difficulty apprehended from the first of draining the channel, where the spring level is near the surface of the ground, is beginning to be felt in this Division. Pumps are at work in some places; but it is clear that drainage cuts to a lower level, which have been commenced, will be the only effectual resource.

391. Of the total excavation during the year, 6,167,270 cubic feet were executed by prison labor.

392. The experiments on removing the spoil from the deep excavation by engine lifts and other mechanical appliances were continued during the year; the results are not yet satisfactory, though somewhat better of late. The difficulty of obtaining a sufficient amount of free labor for the excavation in this Division, alluded to in last report, has considerably decreased, owing to some good European Contractors

having taken up a portion of the work, and bringing with them large bodies of men.

AGRICULTURAL.

*Sirhind Canal.*

393. Progress in collection of materials for masonry works—

	Cubic feet.
Block kankar, quarried ... ..	589,804
„ dressed ... ..	147,510
„ for lime ... ..	17,470
Boulders collected ... ..	285,517
Fire-wood ... ..	381,153
Lime-stone ... ..	100,277

394. *Railway.*—Sanction was given in the early part of the year to the construction of a temporary line of railway along the canal line from Rûpar to the crossing of the Panjáb and Dehli Railway, a distance of about 37 miles, with the view chiefly of substituting block kankar and stone for bricks in the construction of the masonry works, and for the conveyance of the other building materials, most of which must be brought either from the neighbourhood of the low hills or from the districts to the southward.

395. The whole of the sleepers and rails required for this Division were in hand by the close of the year, and the laying of the road commenced.

396. All the shelter required for the establishment, permanent and temporary, was completed. 2nd Division.

397. *Excavation.*—The progress in this Division during the year was extraordinary, as the greater number of the workmen who flocked up from the south settled down to the work here, the soil being lighter than in the 1st Division.

	Cubic feet.
Total quantity ... ..	500,000,000
Excavated during year ... ..	254,941,254
„ to end of year ... ..	302,265,607
	Rs.
Expenditure during year ... ..	8,99,000
Budget grant ... ..	9,00,700

Nine miles, out of the total length of 17 miles in the Division, were all but finished at the close of the year; the remainder, except the deep portions where mechanical appliances are being tried, will probably be completed in 1872-73.

398. In the Chamkour escape, out of a total of 15,468,000 cubic feet, 4,493,857 cubic feet have been excavated.

399. The workshops at Kirrí were completed, with exception of a portion of roofing.

400. The materials for the masonry works in this Division will be collected at the several sites as soon as the Railway is in working order.

401. Small quantities of bricks and kankar have been landed here and there.

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AGRICULTURAL.*Special Survey Division.*

402. *Canal Railway.*—The earth-work for the road is nearly complete, as the line for the greater portion of the length runs along the canal bank. The junction with the Panjáb and Dehli Railway was laid, as well as some two miles of the permanent-way. A considerable proportion of the sleepers and rails had been received up to the close of the year, and a locomotive was daily expected.

*Special Survey Division.*

403. Until the close of the hot weather, the establishment of this Division were employed in preparing the designs and estimates for the complete project referred to above. The remainder of the year was occupied in further exploration of the country and contour levelling, with the view of determining the alignments of the distributaries from the several branches. The aggregate length of surveys and levels was about 3158 miles.

## General.

404. The Panjáb Canal and Drainage Act, No. XXX of 1871, was passed by the Legislature on the 30th October. A Draft of Rules under the Act was drawn up in the month of December by a Committee of Civil and Canal Officers, under the orders of the Local Government, which, after revision, will shortly be submitted for the sanction of the Government of India.

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## GUARANTEED RAILWAYS.

405. The amalgamation of the four separate undertakings of the Sindh Railway Company, viz., the Sindh Railway, the Indus Steam Flotilla, the Panjáb Railway, and the Dehli Railway, into one Company, entitled the Sindh, Panjáb, and Dehli Railway, having received the Royal assent on the 12th July 1870, it became imperative that the control should be entrusted to one administration. On the 13th May, the control of the late Sindh Railway and Indus Steam Flotilla was transferred from the Government of Bombay, and confided to the Government of the Panjáb. Her Majesty's Government having assented to this measure, and also to the centralization of the control of the Guaranteed Railways in Upper India, and of the State Railways generally, the amalgamated Sindh, Panjáb, and Dehli Railway, passed under the direct control of the Government of India on the 10th October.

## GUARANTEED.

Amalgamation of  
Sindh, Panjáb, and  
Dehli Railway.

406. The through-booking arrangements, introduced on the first day of the year 1870, were still further extended, and passengers and goods can now be booked from stations on the Panjáb and Delhi Railway to Madrás, Bombay, Barodá, and Ahmídábád.

Through-booking.

407. The heavy floods during the rains have been most disastrous to the Railway. The first of these occurred in the Gaggar river on the 25th of June, and which caused a settlement of one of the piers of the bridge over it, damage to the embankment, and consequent break in the through-communication. This was followed by the subsidence of the abutments of the bridge over the Sirhind nallah on the 27th. Immediate action was, however, taken to repair these damages, whereby the through-communication was restored on the 1st July.

Damage to works  
over the Gaggar  
and Sirhind nallah.

408. Again, on the 22nd July, the embankment between Jagádhri and Sirsáwah, one-and-a-half miles from the east bank of the Jamná, was breached, and the through-communication again broken. This was followed by another flood on the 23rd; but the damages sustained being slight, the through-communication was again established by the evening of the 24th July. On the same evening a heavy flood occurred down the Biás river, followed by a second on the 27th, which washed away the embankment behind the east abutment of the bridge. The flood continuing, one of the piers was scoured out on the 31st, and fell carrying two spans of girders with it. On the same day the embankment between the stations of Barrará and Jagádhri was breached, and one abutment of a small bridge carried away.

Damage to works on  
Dehli Line by heavy  
floods.

**GUARANTEED.**

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On the 7th August, the wing-walls of the Jamná bridge began to show signs of weakness; on the 9th, one pier of the Gaggar bridge fell with its two spans of girders; and on the 11th the line between Sirsáwah and Rájpurah was entirely closed for traffic.

By the 6th of October the line was again opened for through-traffic, diversions having been made across the Gaggar and the smaller streams, and leaving but one break, that across the Biás river, where a temporary wooden structure is being erected to complete the through-communication, till the restoration of the permanent bridge.

**Accidents.**

409. During the year two accidents of a serious nature occurred, happily unattended with loss of life: the first, on the 28th July, when an engine and tender with four other vehicles ran into the gap behind the east abutment of the Biás bridge, and were totally engulfed; and the other, the snagging of the steamer "*Parah*" in the month of December, with almost entire destruction of cargo.

**Financial prospects.**

410. The financial aspect of the line has not improved during 1871-72. The Lahore-Multán Section barely pays its working expenses, and the sparse population and barren nature of the district forbids hopes of a rising traffic. On the Lahore-Gházíábád Section the prospects are brighter; but even here the Railway has not the entire confidence of the traders, and it is notorious that it does not bear the full traffic of the country.

411. The attention of the Government of India has been turned to the absolute necessity of reducing the working expenses of the line, and the establishments in every Department have been greatly cut down.

**Sindh Railway and  
Indus Steam Flo-  
tilla.**

412. The contract of the Sindh Railway and Indus Steam Flotilla has been transferred from the Government of Bombay to the Government of India, and the accounts of the Sindh Section are now referred for settlement to the Accountant General, Lahore.

413. The Sindh Section extends from Karáchi to Multán.

414. The Capital may be roughly taken at £2,428,428, and includes £432,473, the value of the fleet, and £163,718 for stores in stock.

415. The result of the work for the official year is a profit of Rs. 1,82,607; the receipts being Rs. 15,16,415, and the expenditure, Rs. 13,33,808.

416. The profit for the official year 1870-71 was shown to be Rs. 3,50,378, with an increased traffic of about 5000 tons of Government stores.

GUARANTEED.

417. The expenditure, compared with that of the previous year, is Rs. 2,14,922 less.

418. During 1871 nearly 83,000 passengers have used the Railway, and 6,000 the Flotilla. Review of traffic.

419. Nearly 87,000 tons of goods have passed over the Railway, and 22,000 tons have been carried by the Flotilla to various points along the river.

The up-traffic has decreased in the quantities of Government stores, grain, and railway material, and the down-traffic has increased in grain, cotton, and wool.

420. The rates for the conveyance of fire-wood to Karáchi have been reduced, and small timber for building purposes is now carried in the same class as fire-wood. Reduction of rates with view of increasing traffic.

The rates for all exports north of Montgomery, on the Panjáb Line, were reduced 25 per cent. between Sher Sháh and Kotrí, and a similar reduction was allowed on the rates for edible grain and oil seeds between Kotrí and Karáchi.

Iron in bundles, plates, steel, spelter, &c., has also been carried at a reduction of 25 per cent. from Karáchi to Kotrí.

A terminal charge of three pies per maund has been levied on all goods (except 1st class) booked at Kotrí and Karáchi.

In the Flotilla service, fares for passengers to intermediate stations have been introduced.

The first reduction of 25 per cent. in rates by steamers for up-traffic having failed to secure an increase, market rates were introduced at Kotrí, on the same principle as at Multán, for the down-traffic.

421. The Frere Street Station has been completed, and the work of lowering the bank between the Malear Station and the viaduct finished. Frere Street Station.

422. Special repairs to the Steamer "*Lawrence*," Flats "*Sakkar*," and "*Alabama*," have been completed, and ordinary repairs to the fleet, amounting to Rs. 80,000, have been executed. The additions and alterations to the Factory at Kotrí have been carried out. Repairs of fleet.

423. The use of wood as fuel for locomotives has been commenced, and a stock of coal maintained in reserve, sufficient for six months' consumption of one train each way daily. Use of wood-fuel.

GUARANTEED.

The consumption in 1871 has been for—

		Coal.	Patent fuel.	Wood.	
Railway	...	2,310	183	969	tons.
Flotilla	...	...	...	27,314	„

Maintenance of  
Telegraph.

424. The question of Telegraph maintenance has been considered, whether it would be more advantageous for the Company to continue to maintain the Telegraph along the line, or that Government should undertake the work on certain conditions. The cost by the transfer would have been increased approximately from Rs. 11,500 to Rs. 15,000 per annum.

Accident to steamer  
"Parah."

425. One accident only of a serious nature has occurred. In December last, the Steamer "*Parah*" was snagged close to Sher Sháh, and the cargo almost entirely destroyed, entailing a heavy loss on the Company.

Changes in Staff.

426. On the departure of the Traffic Manager on sick leave in May last, the office of the Assistant Traffic Manager was located at Kotrí, instead of at Karáchí, to ensure a better supervision of the Flotilla.

Two deaths have occurred during the year. In May, Mr. McNeill, Traffic Manager, died in Bombay. In November, Captain Wood, the Agent, died in England, and it is upon record that he was a man of superior talents and energy, and an officer well acquainted with the affairs of, and devoted to, the interests of the Company.

Since October, Mr. Newnham, Chief Engineer, has carried on the duties of Agent's Department, in addition to his own.

STATE.

State of works in  
April 1871.

PANJAB NORTHERN (STATE) RAILWAY.

427. At the beginning of the year (April 1871), matters had but very recently emerged from a state of initiative uncertainty affecting the new system of State Railways in general, and the construction of this line in particular. Although much had been done in the determination of important points, such as of gauge, character and extent of flood-openings, renewal, alterations, and additions to existing road bridges, amount and description of Station buildings, and nature of Station-yard, watering and other arrangements, &c., the actual progress hitherto then attained had been, nevertheless, one much more in preparation and commencement than in tangible and positive results. Even at that date there still, moreover, remained unsettled radical questions connected with the three main bridges—Ráví, Chináb, and Jhelam, that is, with the exceptional structures which above all constitute the work of

this staff, and the real difficulties of the undertaking. These questions concerned the form, strength, and purpose of the girders, the kind of roadway, single or double, to be given to these bridges, and they necessarily affected from their base upwards the designs for their abutments. It had been, however, determined that the piers of these bridges should be single wells of 12' 6" diameter, sunk to a depth of 50 feet in the beds of the two former rivers, and to one of about 40 feet in the shingly substratum of the last, and arrangements were being actively urged forward for a good start in the sinking of these wells directly the floods of the year were over. The waterway then given on the three rivers was as follows :—

Rávi,	33	spans	of	85'	in	clear,	or	3205'	from	face-to-face	of	abutments.
Chináb	97	"	of	"	"	"	"	9445'	"	"	of	"
Jhelam	48	"	of	"	"	"	"	4180'	"	"	of	"

STATE.

428. Matters as to these great works were in this state when there occurred the heavy floods of July, and their destructive consequences on the existing structures of a similar character over the other sandy-bottomed rivers of the Panjáb crossed by the Sindh, Panjáb, and Dehli Railway. These disasters, and the conclusive evidence they afforded of the necessity for deeper and more massive foundations, led to a reconsideration of the subject of dealing with the still larger and costlier bridges on this line. Various proposals were made, estimated for, and discussed in detail. Among these may be enumerated single brick-work cylinders of a large diameter (18 feet), double and triple series of wells of different diameters, oblong or composite wells with a double shaft, utilizing existing curb-cutters, &c., all to be carried as far into the sandy bottom as the point of reaching the underlying clay, or the possibilities attainable with the means and appliances available, might determine.

Effects of floods  
of July on the  
bridge works.

429. In September a Committee of leading Engineers was appointed by the Governor General in Council to meet at Simla on the designs for these bridges in connection with the above experiences, drawings, reports, estimates, and other documents being sent up for this purpose.

Committee of Engineers at Simla on  
main bridges, and  
its results.

As the result of these deliberations and of the Committee's recommendations given in October, the orders of the Government of India were soon afterwards issued, determining among other matters that—

1st. The waterway of the three rivers should be—

Rávi	33	spans	of	85'	clear,	or	3205'	between	faces	of	abutments.
Chináb	64	"	of	129' 6"	clear,	or	9088'	ditto	ditto		
Jhelam	50	"	of	85'	clear,	or	4862'	ditto	ditto		

2nd. That the piers should consist, on Rávi and Chináb, of three wells of 12' 6" diameter, sunk to a depth of 70 feet if possible ; and, on the

## STATE.

Jhelam, of one central 12' 6", and two flanking 10 feet diameter wells, sunk to a depth of about eight feet into the shingle, or about 30 feet below the bed of the river ; and,

3rd. That the abutments should be partly of wells similarly treated to those of the piers, and partly of others to a lesser depth in a protective enclosure of curtain blocks, &c.

430. The superstructure of these abutments, and all, save the front row of three deep wells, necessarily, however, remained an open question, pending information from England as to the single or double character of the roadway to be adopted for these bridges.

River-training works  
on Rávi, Chináb,  
and Jhelam.

431. The *training works* on the three rivers to regulate and direct the flow of the stream towards and through the respective waterways were also discussed by the Committee, and thereafter finally decided upon by Government.

432. The series of dams and spurs above Lahore, on the Rávi back channel, while it had completely shut out the river at Mahmul Bhutí and Lakodar, had been unsuccessful in keeping out the river inundations, owing to the absence of a lateral defence work. It was therefore ordered that a continuous embankment should be made to connect the head works at Mahmul Bhutí with the Railway formation, and that these head-works themselves should provide sluices, permitting the entrance of a sufficient but limited flow of water. Free action was left, in this way and by the addition of about 120 feet in all of openings in the Railway embankment over the back channel, to the flow of the current necessary for the sanitation of the city and its suburbs.

433. The extensive works on the Chináb, of a similar character and object, although severely tested by the exceptional floods of July, having successfully done their duty, and been otherwise approved of, were to be completed as designed. Those on the River Jhelam were also accepted with certain modifications tending to diminish their cost.

Effect of Govern-  
ment orders on the  
bridge work of the  
season.

434. These orders, although materially setting aside the Engineering arrangements already made on the ground for the season's work in bridge foundations, led to instant and vigorous activity on the three River Divisions, and effect was given to them by a commencement, on the Rávi, of 30 wells, or 10 piers; on the Chináb, of 42 wells, or 14 piers; and on the Jhelam, of 36 wells, or 12 piers.

435. At the close of the official year all these wells were well advanced, more especially on the Rávi and Chináb, and gave promise of being all safely bottomed and concreted before the time of the heavy floods, thus forming altogether, as one season's result only, an amount of bridge well-sinking, I believe, before unprecedented alike in kind and amount.

436. The work of the season thus accomplished on these foundations will be on the Rávi one-third, and on the Chináb and Jhelam one-fifth, of the whole. With a timely supply in rails of the enormous weight required for loading these deep wells, I am confident of our being able to complete these works on the Rávi next year (1873), and on the Chináb and Jhelam before the close of the following year (1874). The brick-work done in pier wells during the five months has been 920,000 feet cube (that is, 700,000 of brick-work, and 220,000 cubic feet of concrete), and the amount of sinking in lineal feet, chiefly in cylinders of 12' 6" diameter, will have been upwards of 8,000, or one-and-a-half miles in total length.

437. The total materials prepared or collected to March 31st were—

Bricks <i>burnt</i> of all kinds	2,94,04,535, or nearly 29½ millions.
Fuel	15,12,000 maunds.
Surkhí	2,76,264 "
Lime	4,00,152 "
Timber in log (inclusive of that for sleepers)	8,12,408 cubic feet.

STATE.  
Large amount of bridge work done during the year.

Materials prepared or collected to end of year.

438. At the same date the amount of work done in river-training works was :—

Earth-work in bunds and dams	1,77,51,000 cubic feet.
Tree-spurs, 86,500 lineal feet (nearly 6 miles).	
Piling and palisading	2,800 running feet.
Plantations in willow and other shrubs	600 acres.
Sand bags in embankments	90,000

Amount of work in river-training measures.

On the Chináb alone there are more than 3 miles in length of massive embankments, with slopes towards the river of 1 in 10, grassed and skirted by rising groves of willow and sissú, &c.

439. On the other large bridges of the line, a considerable advance has been made during the year. The brick-wells for the Bhimbar (20 spans of 40 feet) are being sunk with rapidity. The structure will be ready for its iron girders by October next, these having been indented for from Home. At the Palkú (9 spans of 40 feet), the north abutment wells, eight, have been sunk to 55 feet in depth. Further progress was delayed with the rest of this bridge owing to the effects of the heavy floods of July. The Chináb overtopped its flood banks above Wazírábád, and a large body of the flood-stream passed down this nallah, carrying with it the tempo-

Palkú and Bhimbar bridges.

STATE.	<p>rary bridge, and demonstrating the necessity of a considerably enlarged waterway, as well as of other measures in construction, to give a sufficient guarantee of safety. Proposals are now before Government to this effect, and an early decision is expected. Operations will be therefore probably resumed in September next, and all be up to girder level by May or June 1873.</p>
Minor bridges, flush gaps, and culverts.	<p>440. Between Lahore and Gujrát all the other bridges have been completed with wrought-iron girders in place, except the special gap openings which await their iron tops. Between Gujrát and Jhelam everything has been done to the similar structures, except the placing of the girders and iron tops (rolled beams for special gaps). If the latter were forthcoming, all could be easily ready by October next.</p> <p>All the masonry small bridges and culverts in the diversion through the Pabbí hills near Khárián are closed in.</p> <p>The total quantity of masonry executed on all works, when operations are stopped before the rains, will be 1,820,000 cubic feet.</p>
Rávi and Palkú temporary bridges.	<p>441. The temporary bridges over the Rávi at Lahore, and the Palkú nallah at Wazírabad, both suffered severely in the autumn floods. The latter was destroyed, and the former breached in several places, as well as turned at its Lahore end by a change in the set of the stream southwards, 29 of its 14 feet spans being carried away. In both cases nearly all of the materials were afterwards recovered. The Rávi structure was rapidly rebuilt in October and November, and to 602 feet of greater length, being now 2198 feet from end-to-end. That over the Palkú was also quickly restored, and is now of a more substantial character, and intended for service locomotive traffic. It consists of 20 spans of 18 feet, and is 360 feet in total length.</p>
Earth-work, Khárián Pass cutting, &c.	<p>442. The heavy cutting through the Pabbí hills is nearly finished, much difficulty having been caused by the excessive hardness of the clay and by the constant scarcity of labor. Gunpowder has been necessary throughout, and the workmen are nearly all Cabulís, who disappear during the hot and rainy seasons. Notwithstanding this, by the end of July or August next, nothing will remain to be done under the head of earth-work, beyond the filling in behind the abutments to large bridges, which must stand over till they are built. At the end of the year there had been executed in all 29,000,000 cubic feet.</p>



443. All station buildings and general station arrangements were in a forward state, but little remaining to be done besides the wells and water-tanks. These will be all out of hand before the coming rains are over.

STATE.  
Stations.

444. The sleeper provision of the line closely approached a termination, about 200,000 having been cut and stacked in the saw-mill yards of the three rivers. A few months more will suffice to turn out the remaining quantity, and arrangements have been made to cut up at Jhelam 100,000, and at Sháhderah 50,000, for the Indus Valley Railway.

Sleeper production.

445. Of the ballast for the 103 miles at present sanctioned, about 30,000,000 cubic feet, chiefly in old broken bricks, or 60 per cent. of the entire quantity, had been collected. The balance wanted being chiefly on the Khárián Division, where it cannot be economically obtained until the rails have been provisionally laid, and then it can be trucked down from the Pabbí depôts with ease and expedition.

Ballast.

446. Towards the end of the year the new 36-lb. rails began to arrive in India. They are urgently wanted here for the construction of the large bridges; an immense weight, in some cases 200 tons on each, being indispensable to force the foundation wells down to the required depth. With the great number of these wells to be sunk, according to my programme for next season's operations, there will be needed nearly the whole 100 miles of this material, over and above some 3000 tons of that for the 5' 6" gauge already in use in this way. This will unavoidably delay the laying of the road between the rivers in favor of the earlier completion of the main bridges, unless a special supply of this means of weighting should be meanwhile otherwise forthcoming. The balance of the 44 miles of the 60-lb. per yard material now on the line is doing service in work's tramways, of which some 18 miles have been laid on the several Divisions.

Permanent-way material.

447. Four of the new metre gauge locomotives destined for this line had already left England, and were expected in Lahore in May. Some delay seems likely to occur, however, in the arrival of way and works wagons, without which these engines cannot be utilized, as intended, for the telescopic road-laying. Even, however, were all this constructive rolling-stock on the ground, the fact I have above mentioned, of nearly all the rails being essential for the expeditious progress of the bridge works, would prevent its being applied to opening up between these bridges, unless under one of the two conditions, of either deferring their completion for several years, or of providing about 70 miles of more rails.

Locomotives and  
way and works  
wagons.

STATE.  
Tools and Plant.

448. During the past year large deliveries of Tools and Plant for construction have been made on the Bridge Divisions, both from Indian sources and on Home indents; and those under the latter continue to be sent up in increasing quantity. Busy as the yards and workshops at Sháhderah, Wazírábád, Kathálah, Naurangábád and Jhelam, have been during the last twelve months, a very considerably augmented industry and activity may be looked for throughout that on which we have now entered. With gigantic works of the character of those which distinguish this Railway, and done as they are under circumstances of unusual rapidity, the expenditure under the head of Plant is necessarily a large one, and will not fall much under a total of Rs. 9,27,590.

General progress  
made.

449. The progress of the works between Lahore and Jhelam may be regarded, I think, as on the whole eminently satisfactory, and is so, not only on account of what has been actually done, but also on account of all that has been now rendered immediately possible by the settlement of all the important outstanding questions relative to the main bridges. Within the first three months of the new year (1872-73), everything will have been disposed of in approved detail designs and regularly sanctioned estimates. All that will then remain to be done will be to push all forward to an early and successful completion.

Prospect of final  
completion.

450. From the experience I have had of the Engineering Staff to which this duty is entrusted by Government, and of the ground gained since the great start, that on these bridges, was made in November last, I can now confidently look forward to an earlier termination than seemed probable at this time last year. The conditions of weight for our wells, as that of the timely delivery of the girders, being complied with, I believe we may safely look forward to the opening up from Lahore to Wazírábád by 1st January 1874, and throughout to Ráwalpindi by 1st January 1875.

Extension of works  
to Ráwalpindi.  
Cost of extension  
line.

451. A complete project and estimate for the extension of the Railway to Ráwalpindi were submitted by me to Government in March. These estimates showed that the mileage cost of these 73 miles of extension will be one varying from Rs. 39,625 (£3,963) to Rs. 43,300 (£4,330) only, according to the weight of the permanent-way which may be adopted.

452. Should the approval of Government be accorded to this project, the works may be put in hand in September or October next, without any increase in the present Engineering Staff.

453. The different points which have hitherto interfered with exact and final drawings and estimates have been now so far determined as to permit a very close approximation to the total cost of the line as far as Ráwalpindi. The total cost will be Rs. 1,97,30,504 (£1,973,050), or at the rate of Rs. 1,15,700 (£11,570) per mile.

If from this sum we deduct a sum of Rs. 89,10,330 (£891,033), on account of large bridges and their training works, the balance is one of Rs. 1,08,20,175 (£1,082,017), or of Rs. 63,440 (£6,344) per mile only.

454. Deduction being made in this way of bridges, the mileage rate between Lahore and Jhelam is one of Rs. 79,060 (£7,906), or Rs. 39,430 in excess of that as above from Jhelam to Ráwalpindi. The causes of this difference lie in the fact that the former sum includes all preliminary and establishment charges from 1866 to September 1872, a heavy expenditure in flush gaps, of which there are none on the Trans-Jhelam length, the cost of several entirely new large bridges, as the Palkú and Bhimbar, all the work in the Khárián Pass Diversion, and much more frequent and heavy alterations and additions to the existing Trunk Road bridges, &c.

455. A scheme of arrangements for the mutual working of the Lahore Station of the Sindh, Panjáb, and Dehli Railway, by the wide and narrow gauge traffic, has been submitted to the Government of India, and is now under its consideration.

456. During the past year a new Division has been added to this Railway, that, viz., of the Indus Tunnel, Government having required a re-examination of this tunnel scheme, and the preparation of detail papers for its construction, and working by means of hydraulic lifts; and at the same time a comparison of the relative cost of these works and of the actual, or now possible new, bridge alternatives. Mr. H. T. Geoghegan was detached from the Staff on the Survey Divisions, and posted to Attok for these duties in December.

457. The other members of the Survey Staff have been engaged since January in carefully examining the country between Jhelam and the Mayo Salt Mines near Pind Dádan Khán by the right bank of the river, and from Lála Músá to Miání, on river opposite to Pind Dádan Khán by the left bank, with a view to the preparation of reports and alternative detail proposals for a branch line to these mines. All

## STATE.

Cost of line between Lahore and Ráwalpindi, and mileage rates with and without bridges.

Cause of difference in mileage rates between Lahore and Jhelam, and Jhelam and Ráwalpindi.

Lahore Station General arrangements.

Indus Tunnel Division.

Surveys for branch line to Mayo Salt Mines, &c.

STATE.

the necessary field data have been now fully obtained; and will be disposed of before these Engineers are likely to be required on the extension construction above Jhelam.

Changes in the Staff.

458. Mr. James Collet has been, at his own request, retransferred from the Indus Valley Railway to this Line, and will be posted to the charge of the Survey Divisions. On 1st February, after nearly two years' absence on special duty in England, Mr. H. Lee Smith ceased to be Chief Engineer of this Railway.

Mr. J. F. Stokes, Executive Engineer Khárian Division, has been transferred to the Public Works Secretariat of the Government of India as Assistant to the Consulting Engineer for Railways.

Lieutenant T. B. B. Savi, R. E., of the Rávi Bridge Division, has been transferred from the Railway as Officiating Deputy Consulting Engineer for Guaranteed Railways, Panjáb.

I. V. S. RAILWAY.Operations during the year.INDUS VALLEY (STATE) RAILWAY.

459. The year under review may be described as one of preparation rather than progress. At its commencement two survey parties were in the field : the one under Mr. Collet, between Multán and Khánpúr ; the other under Mr. Nether-sole, between Khánpúr and Rohrí ; the whole being under the general superintendence of Colonel Pollard, R. E., Consulting Engineer for Railways to the Government of the Panjáb. As soon as the field-work was completed, the former of these parties concentrated at Multán, the latter at Murree, and proceeded to put in hand the final designs and estimates for the line. These were completed and submitted to the Government of India in all October, and final approval and sanction were intimated by that Government in November ; instructions being given to commence work forthwith. These orders did not find the two parties in an equal state of readiness. In the Multán District the line was permanently staked out ready for work to commence. In the Rohrí (now Upper Sindh) District it had to be restaked and levelled afresh. Hence, whilst in the first work was commenced in all January, only a very partial start could be made in the latter, and but little could in consequence be done during the year.

Line between Rohrí and Kotrí.

460. Meanwhile, surveys for the extension of the line between Rohrí and Kotrí were ordered to be put in hand ; and a new district, the Lower Sindh, was formed and placed under Major Bonus, R. E., as Superintending Engineer. The supervision of the works was transferred to the Government of

India, and the whole line from Kotri to Multán was placed under the charge of an Officer with the powers of Chief Engineer.

STATE.  
—

*Multán District.*

461. The work done during the official year comprised 29½ millions cubic feet of earth-work thrown up, representing about 70 miles of finished embankment ... 10,30,000

Bricks made and burnt ... c. ft. 1,84,000

Broken brick ballast collected, and 19 units of staff quarters finished and occupied.

*Upper Sindh (late Rohri) District.*

462. The only thing in which any progress was made was the earth-work, of which eight millions cubic feet were thrown up.

*Lower Sindh District.*

463. By the end of the official year under review, the survey work in this District was drawing rapidly to a close, and was entirely completed by the 1st of June. It has comprised 226½ miles of centre line selected and staked out, 35½ miles of alternative line run, and 361 miles of cross sections taken. The work has been hard, and the amount done reflects much credit on Major Bonus and his staff.

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# APPENDIX.

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, IMPERIAL, FOR THE YEAR 1871-72.

Section A.—Ordinary and Extraordinary.

SERVICE HEADS.	Grant.	Outlay.	DIFFERENCE.	
			Unspent balance of grant.	Excess.
	Rs.	Rs.	Rs.	Rs.
<b>ORIGINAL WORKS.</b>				
Military ... ..	18,88,000	13,35,150	47,850	
Civil Buildings ... ..	10,000	10,909	...	909
Communications ... ..	...	65,600	...	65,600
Agricultural { Extraordinary ... ..	28,44,000	22,84,709	1,09,291	
{ Ordinary ... ..	89,000	88,158	842	
	38,26,000	37,84,526	91,474	
<b>REPAIRS.</b>				
Military ... ..	8,87,000	4,70,811	...	1,33,811
Civil Buildings ... ..	7,000	7,730	...	730
Communications ... ..	...	8,565	...	8,565
Agricultural, Ordinary ... ..	5,00,000	3,88,048	1,11,957	
	8,44,000	8,70,149	...	26,149
<b>ESTABLISHMENT.</b>				
Agricultural, Extraordinary ... ..	9,18,000	6,93,384	2,24,616	
Other Services ... ..	10,50,000	12,54,163	...	2,04,163
	19,68,000	19,47,547	20,453	
<b>TOOLS AND PLANT.</b>				
Agricultural, Extraordinary ... ..	1,66,000	8,081	1,57,969	
Other Services ... ..	55,000	49,404	5,596	
	2,21,000	57,485	1,63,565	
<b>PROFIT AND LOSS.</b>				
Agricultural, Extraordinary ... ..	...	427	...	427
Other Services ... ..	...	1,116	...	1,116
	...	1,543	...	1,543
Total ... ..	68,59,000	66,11,200	2,47,800	
Less decrease in Stock ... ..	...	1,08,677	1,08,677	
	68,59,000	65,02,523	3,56,477	
Deduct Expenditure in England ... ..	9,010	6,188	2,822	
Reduction in grant ... ..	1,00,000	...	1,00,000	
	67,49,990	64,96,335	2,53,655	
Add balances of Stock purchases and sales, and Miscellaneous advances of Irrigation Divisions ... ..	...	51,721	...	51,721
PUBLIC WORKS PROPER ... ..	67,49,990	65,48,056	2,01,934	

*Section A.—Ordinary and Extraordinary—continued.*

Expenditure on Imperial Works from funds supplied in addition to the Budget grant.					Amount of contribution.	Outlay.	Less.	More.
					Rs.	Rs.	Rs.	Rs.
<b>CONTRIBUTIONS.</b>								
Original Works—Civil Buildings	...	...			197	190	7	
Agricultural, Ordinary...		...			2,343	2,073	270	
Repairs—Military	...	...	...	...	6,762	6,762	...	
Agricultural	...	...	...	...	2,38,643	15,130	2,23,513	
<b>Total</b>					<b>2,47,945</b>	<b>24,155</b>	<b>2,23,790</b>	

D. C. GORDON,  
Deputy Controller for Controller Public Works Accounts, Panjáb.



**PART I—continued.**

**ACCOUNT OF APPROPRIATION FROM IMPERIAL FUNDS DURING 1871-72, ARRANGED BY  
HEADS OF SERVICE.**

*Section B.—Ordinary Expenditure only.*

SERVICE HEADS.	Grants.	Outlay.	DIFFERENCE.	
			Unspent balance of grant.	Excess.
	Rs.	Rs.	Rs.	Rs.
<b>MILITARY.</b>				
Original Works ... ..	18,88,000	18,85,150		
Repairs ... ..	8,87,000	4,70,811		
	17,20,000	18,05,961		
Less decrease in Stock ... ..	...	2,03,629		
	17,20,000	16,02,332		
Deduct Expenditure in England ... ..	...	6,188		
	17,20,000	15,96,144		
Deduct reduction in grant ... ..	1,00,000			
<b>Total ...</b>	<b>16,20,000</b>	<b>15,96,144</b>	<b>23,856</b>	
<b>AGRICULTURAL.</b>				
Original Works ... ..	89,000	88,158		
Repairs ... ..	5,00,000	8,88,048		
Balance of Stock purchases and sales on 31st March 1872 ... ..	...	2,764		
Balance of Miscellaneous advances on 31st March 1872 ... ..	...	8,324		
	5,89,000	4,82,289		
Less decrease in Stock ... ..	...	28,317		
<b>Total ...</b>	<b>5,89,000</b>	<b>4,58,972</b>	<b>1,35,028</b>	
<b>OTHER SERVICES.</b>				
Civil Buildings ... { Original Works ... ..	10,000	10,909		
{ Repairs ... ..	7,000	7,730		
Communications { Original Works ... ..	...	65,600		
{ Repairs ... ..	...	8,565		
Establishment ... ..	10,50,000	12,54,163		
Tools and Plant ... ..	55,000	49,404		
Profit and Loss ... ..	...	1,116		
	11,22,000	13,92,487		
Deduct Expenditure in England ... ..	9,010			
<b>Total ...</b>	<b>11,12,990</b>	<b>13,92,487</b>	<b>...</b>	<b>2,79,497</b>
<b>TOTAL ORDINARY EXPENDITURE ...</b>	<b>33,21,990</b>	<b>34,42,603</b>	<b>...</b>	<b>1,20,613</b>

D. C. GORDON,  
Deputy Controller for Controller Public Works Accounts, Panjáb.

# **PART I—concluded.**

## **ACCOUNT OF APPROPRIATION FROM IMPERIAL FUNDS DURING 1871-72, ARRANGED BY HEADS OF SERVICE.**

### **Section C.—Extraordinary Expenditure only.**

SERVICE HEADS.	Grant.	Outlay.	DIFFERENCE.	
			Unspent balance of grant.	Excess.
IRRIGATION.	Rs.	Rs.	Rs.	Rs.
Original Works ... ..	23,44,000	22,84,709		
Establishment ... ..	9,18,000	6,93,884		
Tools and Plant ... ..	1,66,000	8,031		
Profit and Loss ... ..	...	427		
Increase to Stock ... ..	...	1,28,269		
Balance of Stock purchases and sales on 31st March 1872 ... ..	...	17,846		
Balance of Miscellaneous advances on 31st March 1872 ... ..	...	27,787		
<b>TOTAL EXTRAORDINARY EXPENDITURE ...</b>	<b>84,28,000</b>	<b>81,05,458</b>	<b>3,22,547</b>	

D. C. GORDON,  
Deputy Controller for Controller Public Works Accounts, Panjáb.

# **PART II.**

## **DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNT OF THE PANJAB, FOR 1871-72.**

Particulars.	Amount.	References.
<b>ADDITIONS.</b>	<b>Rs.</b>	
<i>Nil.</i>		
<b>REDUCTIONS.</b>		
Portion of Imperial grant for Military Works transferred to Bengal for completing Museum building at Calcutta.	1,00,000	Govt. of India's letter No. 880 A-G dated 10th November 1871, and Memo. No. 437 A-B, dated 13th December 1871.
Reduction in grant, Ordinary, on account of Stores from England.	9,010	Government of India's order on Panjáb Budget for 1871-72, para. 18.
<b>Total Reduction ...</b>	<b>1,09,010</b>	

D. C. GORDON,  
Deputy Controller for Controller Public Works Accounts, Panjáb.

## APPENDIX 2.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS PROVINCIAL SERVICES, FOR THE  
YEAR 1871-72.

Service Heads.	Portions of Grant-in- aid over to Public Works Dept.	Outlay.	DIFFERENCE.		
			Unspent balance of grant.	Excess.	
ORIGINAL WORKS.					
	Rs.	Rs.	Rs.	Rs.	
Civil Buildings ... ..	8,66,160	2,40,747	1,25,413	...	
Agricultural ... ..	32,250	27,642	4,608	...	
Communications ... ..	6,46,920	5,41,487	1,05,433	...	
Miscellaneous Public Improvements ... ..	29,980	35,732	...	5,752	
Reserve ... ..	1,38,272	*	1,38,272	...	
	12,13,582	8,45,608	3,67,974	...	
REPAIRS.					
Civil Buildings ... ..	69,280	87,164	...	17,884	
Agricultural ... ..	43,670	40,227	3,443	...	
Communications ... ..	9,01,370	10,63,213	...	1,61,843	
Miscellaneous Public Improvements ... ..	82,600	73,125	9,475	...	
	10,96,920	12,63,729	...	1,66,809	
Establishments ... ..	4,47,200	4,45,331	1,869	...	
Tools and Plant ... ..	24,780	10,906	13,874	...	
	27,82,482	25,65,574	2,16,908	...	
Add—Increase to Stock ... ..	...	41,999	...	41,999	
„ „ „ Balance of London Stores, Ordinary ... ..	...	52,469	...	52,469	
	27,82,482	26,60,042	1,22,440	...	
Deduct—Reduction in Grant ... ..	4,188	...	...	4,188	
„ Decrease in Balance of London Invoices, Ordinary ... ..	...	52,469	52,469	...	
TOTAL GRANT AND EXPENDITURE ...	27,78,294	26,07,573	1,70,721	...	

\* Outlay included in Service heads.

APPENDIX 2—concluded.

EXPENDITURE ON PROVINCIAL WORKS FROM FUNDS SUPPLIED IN ADDITION TO BUDGET GRANT.

	Amount of contribution.	Outlay.	Less.	More.
	Rs.	Rs.	Rs.	Rs.
<b>CONTRIBUTIONS.</b>				
<i>Original Works—Military</i> ... ..	3,469	3,241	228	
Civil Buildings ... ..	4,400	2,891	1,509	
Miscellaneous Public Improve- ments ... ..	5,812	4,766	1,046	
 <i>Repairs—Military</i> ... ..	5,891	5,151	740	
Civil Buildings ... ..	799	799		
Miscellaneous Public Improvements ...	2,832	2,832		
 <i>Establishment</i> ... ..	1,504	1,330	174	
 Total ... ..	24,707	21,010	3,697	

I. P. WESTMORLAND, *Captain, R. E.,*  
*Controller P. W. A., Panjáb.*

77 77 QQQ

ANNUAL  
PROGRESS REPORT  
OF  
PUBLIC WORKS IN PUNJAB,  
FOR THE YEAR  
1872-73.



LAHORE:  
PUBLIC WORKS DEPARTMENT PRESS.  
1873.



## Note to accompany Annual Progress Report of Public Works in Punjab, for the year 1872-73.

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In the year 1872-73 the formation of a separate Military Works Branch of the Public Works Department was completed, and the new system came into operation. In this Province, the Military Works of the trans-Indus and Hazára Districts, occupied by the troops of the Punjab Frontier Force, remain under the Local Government and the Provincial Public Works Establishment, together with the Cantonments of Jhelam and Talagang, and the Military Rest-houses on the Trunk Road.

2. The chief effects on the Provincial Works, of the separation of the Establishments, have been reported to the Government of India in a Memorandum submitted at the close of the first year of the new arrangement, in April last. The result has been, for the present at least, unfavorable to the progress of the Provincial Civil Works, and to the character of some of the work done, as well as to the advantageous and economical application of the Engineering Establishment. Not so much has been done during the past year as was designed in the programme, and a large amount of the money provided remained unspent at the close of the year.

3. The Military Works in progress in the Frontier Divisions have consisted chiefly of further provision of family quarters for the regiments of the local Force, and improvement of the buildings and stations, and of the water-supply, with the ordinary works of repair and maintenance.

4. No important work has been done in connection with any of the Forts during the past year. His Honor the Lieutenant Governor visited a number of the Outposts on the Deráját frontier in the course of his tour last cold season. The chief arrangements which then came under consideration, having reference to this line of defence, were the advancement of certain of the smaller posts to positions more advantageous for checking the petty raids from beyond the border for cattle-lifting; and, in connection with this, the re-distribution of some of the garrisons, with the general view of reducing the inconvenient extent to which regiments of regular troops (especially Cavalry) have been broken up by dispersion in small detachments on outpost duty. With the larger employment of the local Militia for the watch duties of the first line of advanced small Posts, the regular troops, less scattered, garrison the larger Posts in the more open country in rear. Other modifications have reduced the permanent force at certain points, but do not materially affect the size of the Posts to be built or maintained, which may at any time have to be occupied temporarily in greater strength.

5. The repairs of the outposts and of the communications with them have, for the most part, been superintended by the Officers of the Frontier Force.

6. The most important Civil buildings in progress during the past year have been Jails and Police Stations. A large number of the latter, of different classes, are still required. They are being built on new general plans lately adopted.

7. The Financial Commissioner has been engaged in procuring data for new general plans of Tahsíl buildings. The commencement of several new buildings of this class has awaited the preparation of the new plans, and ten new Tahsíls are

provided for in the present year. These buildings are in one respect not to be on a plan altogether uniform, as, under the differing circumstances of different places, the same provision does not require to be made at each for the residence of the Officials within the Tahsils.

8. The plan of uniting Tahsils and Thánahs in one enclosure, or of combining the two buildings on one general plan, is not now followed; but, where required to be together, the two, designed independently, can, with slight alterations, be built contiguous. For buildings of both classes defensive arrangements are required in some parts of the country.

9. No large Educational buildings were erected during the past year, but towards the close of the year the foundations were commenced of the Lahore College and Normal School, a handsome building, for which an advantageous site was selected in the Civil Station, and near the City, in place of that formerly proposed within the City and facing the Fort.

10. The erection of a new separate hospital for the Lawrence Asylum at Sanáwar has been deferred, awaiting the decision of the Government of India on arrangements connected with the suggested extension of that Asylum, which, if carried out, would require the site that has been proposed for this hospital.

11. In the maintenance of the chief lines of communication the only serious defect and mishap to be noticed is the destruction of part of the railway bridge across the Satlaj at Phillour. This break in the line required a boat-bridge to be re-established at that place for last cold season. The Fírozpur boat-bridge was brought up to Phillour, to secure the early completion of the crossing on the line of railway, and a new one was then built at Fírozpur. The bridge of boats at Phillour will be kept up again for a time this year while the railway bridge is being restored. Temporary railway communication across the gap has been maintained during the present year.

12. The great bridges on the line of the Punjáb Northern (State) Railway, across the Ráví, the Chináb, and the Jhelam, have made good progress during the past year. They are all designed to have a roadway for ordinary traffic as well as a railway line, on the same level; the Ráví and Jhelam bridges having, besides, a foot-way below. They will present in this respect great advantages over the bridges on the Sind, Punjáb and Dehli line between Lahore and Dehli, which have no cart-way in addition to the railway line, as the East Indian Railway bridge at Dehli has. The ordinary traffic crosses the Biás, the Satlaj, and the Jamná, by ferries alongside the railway bridges.

13. In connection with the large bridges now in course of construction across the Ráví, the Chináb, and the Jhelam, important works are maintained for the guidance and control of the rivers. The preparations for the Satlaj bridge near Baháwalpur, on the Indus Valley line, have encountered the familiar trouble connected with the conduct of these rivers,—the alteration of the form and course of the channel by the stream cutting away the banks.

14. The Rájpútáná narrow-gauge line was completed to Rewári in October, but the incompleteness of the rolling-stock did not permit of its being opened for public traffic before the close of the year under review.

15. The use of coal on the Sind, Punjáb and Dehli Railway has not been found economical, the present engines being intended for wood-fuel, and not suited for coal used alone.



16. The number of railway passengers has increased in the past year on the Punjáb and Dehlí line, and diminished on the Sind Section, while the receipts from passengers have increased on both. The amount of receipts from goods has increased on the former, and decreased on the latter. The working expenses on both have been reduced in the past year, and a profit is shown on both, while on the former there was a large loss in the previous year.

Railway traffic.

17. The old highways along the general course of the railway lines continue to carry a great amount of traffic, not confined to local traffic for short distances, for which latter the railway is not convenient where the stations are at long intervals and not very near the towns. The continued large demands on a short piece of road alongside of a railway have been specially brought to notice in the instance of the road from Multán to the Sher Sháh ferry and wharves on the Chináb, which road, notwithstanding the railway on the same line, carries a very large amount of goods traffic in connection with the river navigation.

Traffic on old Highways.

18. While the river steamers continue to ply between Kótrí and Sher Sháh (for Multán) in connection with the railway, the steamer traffic of the Upper Indus has been discontinued as unprofitable, and the Punjáb Government Steam Flotilla has been given up. In consequence of this a stop has been put to the River Conservancy operations also, between Makkad, the upper terminus, and Derah Ghází Khán, which were mainly directed to the improvement of the navigable channels for the steamers. For the native boat traffic it was not necessary to incur the expense of these operations. The Indus Conservancy establishment has been discharged, and endeavours have been made to find suitable provision for the various persons employed.

19. The requirements of one of the important trade routes, east and west, through the Punjáb, came under special consideration when the Lieutenant Governor was at Derah Ismail Khán in December and January. The traders who enter this Province from Afghánistán by the passes to the west of Derah Ismail Khán make their way eastward, through that place, to the large towns. Lahore and Amritsar are almost due east of Derah Ismail Khán, but there is no favorable direct line, and four rivers intervene, three of them without bridges. Taking the route south-east from Derah Ismail Khán, the Chináb is crossed below the junction of the Jhelam, near Jhang, and thence a course continued in nearly the same direction leads to the railway at Chicháwatní after crossing the Rávi by a boat-bridge at that place. His Honor the Lieutenant Governor, on the representation of the local Civil Officers, resolved to have a bridge of boats thrown across the Indus at Derah Ismail Khán, and across the Chináb at the usual ferry (Trimmú) below the junction of the Jhelam. The traffic by this route, which is almost entirely in the cold season, will now be impeded by no unbridged rivers.

Trade routes.

20. The road in the valley of the Upper Biás and across the hills to the valley of the Chandrá and Bhágá (Chináb) and the Bárá Láchá Pass, has been extended and improved under the direction of the Civil Officers of the Kángra District, with much gain to the increasing trade in that direction. No extension has been made during the past year of the Tibet road up the valley of the Satlaj. So far as made it has been kept in ordinary repair.

21. A proposal was received by the Commissioner of Ambálah towards the end of the year for running light passenger carts on the new road from Káلكá to Simla, which has been gradually widened, improved, and protected, during past years. After full consideration had been given to the arrangements required and precautions to be observed, the license was granted to the contractor, and the carts are now running. The trials of fast wheeled traffic, which were made some years ago on the same road when it was less complete, had to be given up in consequence of some serious accidents. The carriages then tried were not suitable for the kind of road. The light vehicles now in use are of an entirely different kind, and appear, so far, to answer well.

Káلكá and Simla Road.

22. The Irrigation Report shows a large amount of work done during the past year, and preparations made for important new works, in connection with existing canals as well as new projects ; in particular the arrangements have now been completed for the masonry dam on the Jamná and new head works for the Eastern and Western Jamná Canals.

23. An arrangement not before attempted in the head works of an irrigating canal from a Himalyan river at its exit from the hills, is noticed at paras. 214 and 235—7 of the Report, the new regulating head for the Bári Doáb Canal constructed on the main channel of the Rávi instead of on a minor branch or side channel.

A large amount of levelling and survey work has been done for new works in contemplation and for improvements of existing works.

24. The chief new hydraulic work of magnitude, comprising many works of much interest, is the Sirhind Canal, from the Satlaj near Rúpar, which will irrigate British Districts and the territory of Native States.

25. Prison labor has been employed largely on the works of the Sirhind Canal, and on the buildings at Rúpar for the prisoners themselves, and to a smaller extent on Jail Works elsewhere. Preparations are being made for employing a larger number on the Sirhind Canal Works.

26. With all the most necessary materials for use in public works, except iron, the Punjáb is well supplied. The iron ores existing in several parts of the Province and adjacent Hill States have not been systematically worked, and are for the most part, so far as at present known, not rich. Further information regarding each of the known iron localities is now being obtained. The distance from the coast adds largely to the cost of English iron and other imported stores. The quantity of iron-work turned out last year from the Mádhopúr Foundry and Workshops was greater than in the year before, and the rates were less than the average of previous years.

27. Stone is used for building in the public works of the Dehlí Division, in the Salt Range, and in the trans-Indus Districts, as well as in the hill tracts along the northern boundary of the Province. Grey sandstone from Chiniót on the Chináb, about ninety miles west of Lahore, is to be used for parts of the Lahore College, lately commenced. Of nearly similar stone are other isolated low rocky hills between Chiniót and Lahore. One of these is the ancient *Sangala*, the buildings of which appear, from the few remains still found, to have been of brick. Boulder stone, for road metal and other uses, is obtained from the beds of the hill torrents which cross the line of the trunk road and railway almost all the way from the Jamná near Sáháranpúr to Pesháwar. The slate of Dalhousie and other places in the Chambá State has been largely used for roofing. Slates from places in the Gurgáon District have been used on buildings at Dehlí. Slab slate is procured from some places in the hills of Hazára, not far from Murree. Statements were obtained last year, in a prescribed form, from every Executive Division, furnishing particulars regarding the lime in use at different places, and the sources of supply. These statements are now being corrected and completed, in certain respects in which they were defective. A full investigation has been made of the stone and lime resources of the country in the neighbourhood of the upper parts of the Sirhind Canal, with reference to the demands for that work.

28. Of three sets of deep boring apparatus obtained for the Punjáb Government from England in 1869, one was procured specially for boring for petroleum. The first use to which the petroleum was to be turned was the manufacture of gas at Ráwalpindí. Of the thirteen places of which the oil springs had been reported on by Mr. Lyman, an American Geologist, whose services had been

procured, under the orders of the late Viceroy, for this purpose, one of the nearest to Ráwalpindí, at Fattah Jang, about twenty miles west of the Cantonment, (at which place the oil had previously been obtained by digging pits or wells), was selected for the first borings. At some of the other springs it was intended that borings should afterwards be made, with the view of ascertaining the resources of the oil tracts, and possibly of obtaining petroleum in quantity sufficient for more general uses. These oil sources in the Districts on both sides of the Indus have been known and used from old times. Whether deep borings at any of these places will succeed in procuring oil in greater abundance, is, of course, very uncertain. It is important to ascertain, in the manner proposed, their probable value. The determination of this question, so far as practicable, by sufficient and well conducted trials, will justify a considerable expenditure on the work, even should the borings be unproductive. Meantime the apparatus which was procured for the purpose has been taken over by the Military Works Branch, to be employed in furnishing oil for the Ráwalpindí Gas Works, which was the primary object for which it was obtained.

29. His Honor the Lieutenant Governor, when in camp at Mári on the Indus, in January last, visited the oil springs of Jábá, about ten miles east of Mári, the first of the places at which, after the British occupation of the Punjáb, petroleum was collected. A small quantity of it was sent to England in 1857 for trial. At the time of His Honor's visit the Sergeant of Sappers who had been employed at the Fattah Jang oil wells was making borings at the Jábá springs, from which the oil was sent on camels to Ráwalpindí for the gas works. The yield at that place had been only about a hundred gallons a month, latterly a little more. The borings had been going on about five months. The depths to which they were carried were very moderate, the greatest was 105 feet. Beyond that depth there was difficulty in managing, with the appliances available, the great weight of the iron rods used in this apparatus. The other kind of boring machine, like those obtained at the same time for artesian wells, and used at Ambálah and in the Deráját, in which the boring tool is worked by means of flat rope instead of iron rods, would be better; but there would be difficulty in transporting to some of these oil sites the engine by which the machine is worked.

30. Many useful works of miscellaneous character for sanitary and other improvement of towns have been carried out in all parts of the Province during the past year. The most important, as a piece of work, is the protection of the town of Derah Bábá Nának on the Ráví from the attacks of the river. The town is situated on the outer curve of a bend of the channel in which the main stream has for some time directed itself towards the bank close to the town. Protection has been afforded by spurs thrown out from the bank. These require constant watching and repair. It is proposed now also to make endeavour to draw part of the stream across the land within the bend of the river, in the course of an old small channel which has been traced by the Executive Engineer, and so afford some relief to the defensive spurs at the town, and aid their work in the formation of new banks.

31. Large areas of land have during the past year been planted with trees, along the lines, and within the influence, of the irrigating canals.

32. The exploration and clearance of Buddhist ruins in Yúsafzaí continued during last cold season by a Company of Sappers whose services were again placed at disposal of this Government for the purpose by His Excellency the Commander-in-Chief, after the Camp of Exercise at Hasan Abdál had broken up. Advice and instructions were obtained by the Officer in charge from Major-General Cunningham, Director of the Archæological Survey of India, who had re-visited the principal sites a few weeks before. The operations during the past season were carried on at *Jamál Garhi*, about eight miles north of Mardán. As

at the other similar ruins in that part of the country, sculptures and coins and other objects of interest have been found, particularly some novel specimens of Indianised Greek architecture. A complete plan has been made of the groups of buildings now exposed. The explorations will be continued at one of the other sites during next cold season.

33. As in former years, various agencies have been employed during the past year in the execution of work of different kinds. Military Officers have superintended the repair of certain roads and outposts on the Frontier. Officers of the Irrigation Branch, on the Western Jamná Canal, have, in addition to their own duties, had charge of the works connected with the Hissár Cattle Farm and Stud buildings. The services of Civil Officers in all Districts have been obtained for supervision of works, chiefly those belonging to their own branches of the Civil administration. The Trunk Road from Lahore to Jhelam, on which the Punjab Northern Railway is being constructed, is in charge of the Railway Officers, who have likewise taken in hand the erection of two Post Offices at towns on the line. A few Provincial Works have been in the hands of the Officers of the Military Work Branch.

34. The management of contracts for public works in the several Executive Divisions has been made the subject of enquiry during the past year, and further specific information on the subject is now being obtained. There has been a tendency in some cases to want of sufficient precision in the arrangements ; an error which is liable at any time to cause trouble, and injuriously affect the works concerned and the business of the Division. Success in the management of the works of a Division is also much affected by the differing degrees of skill of different Officers in utilising their subordinate agency, according to the observed capacities, attainments and character of the individuals. A Native Sub-Overseer who can do good work under one Officer fails under another, and useful men are liable to suffer, as well as the works on which they are employed.

35. There has not been sufficient experience of the working of the new District and Municipal Committees. *District Committees* to allow of a definite opinion being given at present of their success. Independent expression of individual views, with regard to the mode of expending the funds at the disposal of the Committees, will perhaps be of slow growth in case of many of the members ; nor, considering how unused they are to exercise such functions, is this at present a matter of regret. Detailed Rules, defining and explaining the powers of the Committees, and the procedures to be followed have, since the commencement of the present year, been issued for their guidance. Of the *Municipal Committees* the duties everywhere have been increasing, and those at the principal large places have been active and successful.

36. Enquiry has been made, and report obtained, regarding the attendance of the Executive Engineers at the meetings of District and Municipal Committees. The result of the enquiry was on the whole satisfactory, Attendance has been generally as regular as the necessary engagements of the Public Works Officers, and unavoidable absences in different parts of their Divisions, have permitted, and in some instances has been constant and effective. By the standing rules of the Department all Superintending and Executive Engineers are *ex-officio* Members of the Local Committees in their Circles and Divisions ; but the Officers of the Military Works, not being under the orders of the Local Government, are not now available for this duty.

R. MACLAGAN, COLONEL, R. E.,  
Secretary to Government Punjab,  
Public Works Department.

# PROGRESS REPORT

OF

## PUBLIC WORKS IN PUNJAB,

FOR THE YEAR 1872-73.

### PART I.—IMPERIAL.

#### Military.

The Military Stations which remained under the Provincial Government, on the formation of the *Military Works Branch* under the Government of India, were those of the Punjab Frontier Force (except Mardán) and the new Station of *Talagang*. The works also, classed as Military, belonging to the Stud Depot at *Karnál* and Cattle Farm at *Hissár*, were left under the Government of Punjab. Since then the Military Stations of *Mardán* and *Jhelam*, and the rest-house barracks along the line of the Trunk Road, have been made over to the Local Government, which also retained charge of the churches and cemeteries of certain stations which are both Military and Civil. The question of the charge of churches at certain other stations, regarding which a reference was received from the Government of India, is understood to be now under consideration.

MILITARY.

2. The works at *Hissár* were, during the year, under the supervision of the Executive Engineer Hání Division Western Jamná Canals, aided by a small subordinate establishment. Extensive repairs to the Cattle Farm buildings were commenced, but made only moderate progress, owing chiefly to difficulty of giving the requisite supervision and the scarcity of skilled labor; several other large works in the *Hissár* District being in progress at the time.

Hissár.

3. The erection of two hospitals at *Derah Ghází Khán*, one in the Right and the other in the Left Native Infantry Lines, made good progress. The buildings were completed during the year, and occupied.

Deráját.

4. The new Fortified Post at *Sabzíl Kót* was nearly completed. There has been some difficulty in the execution of the work, owing to the scarcity of water.

5. A Rifle-Range was provided for the Regiment at *Talagang*.

Talagang.

6. The extension of the Gurkhá Lines at *Abbottabad* is in progress.

Abbottabad.

## MILITARY.

## Abbottabad.

7. The buildings required for the Mountain Train Battery at *Abbottabad*—workshops, mule-shed, quarters for families and for two Havildárs—were completed.

8. Two wells in the Cantonment, in progress at the beginning of the year, were completed, and a third has since been finished.

9. A Rifle-Range was made for one of the Regiments at *Abbottabad*.

## Kohát.

10. New lines for a Regiment of Native Infantry at *Kohát* were completed. The buildings in the Artillery Lines were re-roofed. A new hospital for the Native Cavalry was nearly finished, the servants' houses were completed, and the hutwards and a kitchen were in progress.

11. The new works for the supply of water for the *Kohát* Cantonment were completed according to the original plan, and have now to be extended to the new Cavalry Lines, and improved.

## Bannú.

12. At *Edwardesabad* (Bannú) the new Artillery Lines were half completed. Two wells in the Cavalry and Artillery Lines were commenced.

13. A double Rifle-Range was in progress.

14. In the Fort (*Dallpigarh*) store-rooms were provided for two Native Infantry Regiments.

15. For the new Outpost to be built at the *Barganathí* Pass, in place of the old Post of *Adhammí*, funds were provided towards the close of the year, and the work has been commenced. Materials collected, and temporary shelter provided.

16. No other new fortified works on the Frontier have been taken in hand during the past year.

17. Many of the Posts on the *Derah Ismail Khán* Frontier were visited by His Honor the Lieutenant Governor in the course of his tour in the cold season, 1872-73.

## Civil Buildings.

## CIVIL BUILDINGS.

## Dagshái &amp; Sabáthú.

## POST OFFICES.

18. Post Offices have been commenced in the Cantonments of *Dagshái* and *Sabáthú*. They are being built by the Executive Engineer of the Hill Roads, as it was not considered desirable, in the Military Works Branch, that they should be built by the Officers of that Branch in charge of the Stations.

19. Some minor Post Offices have been built along the line of Railway.

## PART II.—PROVINCIAL.

## Civil Buildings.

## LAND REVENUE.

## BUILDINGS.

20. The Commissioner's Kacherí at *Hissár* was re-roofed and re-floored. *Hissár.*
21. An Assistant Commissioner's Court-room was added to the Kacherí at *Simla*. *Simla.*
22. The construction of a new Tahsíl at *Derah*, in the *Kángra* District, was resumed. (The work had been suspended on a representation by the Local Civil Authorities that new arrangements, understood to be under consideration, might render necessary a change in the position of the Tahsíl). *Kángra.*
23. A large Record-room was added to the Deputy Commissioner's Kacherí at *Jálandhar*. *Jálandhar.*
24. For the construction of a Kacherí for the Deputy Commissioner and other Civil Officers at *Amritsar*, which has long been much wanted, materials were collected. Hitherto the Civil Courts and Deputy Commissioner's Office, &c., have been held in an inconvenient old native building. The funds have not hitherto been available for the erection of the new Kacherí. *Amritsar.*
25. An ornamental wall round the enclosure of the new Kacherí for the Deputy Commissioner and other Officers at *Lahore* was nearly finished, and a new range of out-offices constructed. *Lahore.*
26. At *Montgomery*, the Record-room of the Deputy Commissioner's Office was enlarged and improved. *Montgomery.*
27. A new Tahsíl was constructed at *Tauzá*, in the *Multán* District. *Multán.*
28. A shed was constructed for petition writers at the District Kacherí, *Ráwalpindi*. *Ráwalpindi.*
29. The progress of the new Treasury building and Record-room at *Abbottabad* was retarded by certain difficulties, but the work has now made good progress. *Abbottabad.*
30. The Tahsíl and Thánah at *Lakkí*, in the *Bannú* District, and another at *I'sá Khel*, in the same District, were completed. *Kohát.*

## BUILDINGS.

Salt Range—Jhelam District.

31. The protective works at the *Khewrá Gorge*, in the Salt Range, near *Pind Dádan Khán*, were nearly completed. These works are for the protection of the sarái, &c., and other buildings threatened by the hill torrent near which they are built, and to preserve the road, to prevent communication with the Mayo Salt Mines being cut off.

Kohát.

32. A Salt chaukí was constructed at Bahádur Khel, in the *Kohát* District.

## JAILS.

Hissár.

33. A block of quarantine cells, with out-offices, well and Native Doctor's quarters, outside the Jail enclosure at *Hissár*, was commenced. These works, like the Military Works at *Hissár*, were under the superintendence of the Canal Executive Engineer. The Native Doctor's quarters, subsidiary buildings, haválat and ten cells were built up to level of wall-plates. The rest of the cells were finished, and fourteen of them roofed in. The enclosure wall was built up to a height of six feet, and satisfactory progress was made with the new well (sunk to full depth, and 40 feet of brick cylinder built).

Dehli.

34. Two blocks of solitary cells in the Jail at *Dehli* were in progress, and were three-fourths completed.

Ambálah.

35. A block of solitary cells in the *Ambálah* Jail was commenced, and the superstructure carried to a height of 10 feet.

Gurdáspúr.

36. Additions to the Jail at *Gurdáspúr* were in progress, but not completed before the close of the official year. The supply of convict labor was scanty.

Amritsar.

37. The new Jail at *Amritsar* for 1008 prisoners is in progress. Two buildings to be used as store-houses afford temporary accommodation for a number of the prisoners who are to be employed on the construction of the rest of the Jail. The surrounding wall has been completed, and the wall of the Workshop enclosure.

Lahore.

38. The erection of iron railings round the hospital in the Central Jail, *Lahore*, was about two-thirds finished. The roofs of old buildings in the Central Jail were extensively repaired.

39. The conversion of the "Golá Sarái" at *Lahore* into a District Jail was commenced. Two blocks of solitary cells were in progress, and materials were collected for the rest of the work.



## BUILDINGS.

40. It has now become necessary to condemn the old buildings at *Lahore* which have served for some years as a Female Penitentiary. A new Female Penitentiary, on an open site not far from the Central Jail, was commenced last year. The foundations of nearly all the buildings were completed, and some of the buildings were ready for roofing. *Lahore.*
41. A lock-up near the Kacheri at *Lahore* for five Europeans and 40 Natives had made satisfactory progress. The Cantonment Magistrate's lock-up at *Mian Mir* has been enlarged.
42. Extensive repairs were carried out in connection with the buildings in the Jail at *Ferozpur*. *Ferozpur.*
43. The new Jail at *Montgomery*, containing accommodation for 500, was nearly completed. The Jail is built of burnt bricks; the enclosure and compartment walls of kachá masonry with coping of burnt bricks in mortar. *Montgomery.*
44. New solitary cells were constructed in the Jail at *Jhang*. *Jhang.*
45. The new Jail at *Derah Ghazi Khan* for 306 prisoners was finished all but a block of solitary cells. *Derah Ghazi Khan.*
46. The enlargement of the Jail at *Derah Ismail Khan*, determined on instead of the erection of a new Jail at *Bannu*, was completed. *Derah Ismail Khan.*
47. The blocks of solitary cells in the Jail at *Rawalpindi*, commenced in the previous year, were finished. A verandah was added to the Jail offices. *Rawalpindi.*
48. A new lock-up was built at *Mardan*. *Mardan.*
49. A lock-up in front of the Jail at *Peshawar* was nearly completed. *Peshawar.*

## POLICE.

50. The Police Station at *Beri* was enlarged and constituted a *Thana*; and a Police lock-up at *Odhá* was in progress in the *Sirsa* District. Two cattle-pounds in this District were constructed at *Ellenabad* and *Chantalu*. *Sirsa.*
51. The construction of a Police Station at *Fattehabad*, in the *Hissar* District, was sanctioned, but not commenced till near the close of the year. *Hissar.*
52. The Police *Thana* at *Nanglowi*, on the *Bahadurgarh* Road, in the *Dehli* District, was completed. New Police Stations were constructed at *Dehli*. *Dehli.*

## BUILDINGS.

- Simla.* 53. A double-storeyed building was constructed at *Simla* for the accommodation of the Provincial Police who had hitherto been sheltered in some Municipal buildings.
- Gurdáspúr.* 54. A Police Hospital at *Gurdáspúr* was completed.
- Lahore.* 55. A bungalow, with out-houses, for a married European Inspector of Police at *Lahore*, was nearly completed. A Police Chauki at *Chúnián*, in the *Lahore* District, was constructed.
- Gujránwála.* 56. A first class Police Station, on the new standard plan, at *Khángah Dográn*, in the *Gujránwála* District, was nearly finished. Another at *Shekopúra*, in the same District, was well advanced.
- Montgomery.* 57. Accommodation was provided for the Municipal Police of *Sydwálá* in the *Montgomery* District.
- Jhang.* 58. A barrack for Reserve Police at *Jhang* was constructed during the year. Four other Police barracks were in progress.
- Multán.* 59. In the *Multán* District two Police Stations, one at *Multán*, the other at *Kabírwála*, were finished before the close of the year.
- Derah Ghází Khán.* 60. A Police hospital, with out-offices, at *Derah Ghází Khán*, was well advanced. Some progress was made with a Thánah at *Panníálah*.
- Sháhpúr.* 61. A first class Thánah was constructed at *Mithá Tiwánah*, in the *Sháhpúr* District. Five cattle-pounds were provided at various localities in the District.
- Ráwalpindi.* 62. A Police rest-house was erected at *Chauntrá*, and four second class Police out-posts were built in the *Ráwalpindi* District.
- Abbottabád.* 63. Materials were collected for a Police hospital at *Abbottabád*.

## EDUCATIONAL.

- Hissár.* 64. Three village schools were constructed in the *Hissár* District.
- Rohtak.* 65. Some out-offices were built for the *Rohtak Zillah* School, and additions to the school at *Berí*.
- Dehli.* 66. Additions and alterations required to the College buildings at *Dehli* were nearly finished. The compound wall and entrance, &c., remained to be done. A grant of Rs. 10,000 was made by the *Dehli* Municipal Committee for school buildings proposed to be constructed there.

## BUILDINGS.

67. Improvements were made to the schools at Kaithal, Karnál. Kunjpúrah, and three other places, in the *Karnál* District.
68. The new Girls' School for the Lawrence Asylum at *Sanáwar* was completed. The building is capable of accommodating 250 girls, and consists of an entrance hall, a large central class-room, and four side class-rooms. This work was done by the Executive Engineer of the Military Works Division.
69. Covered tanks for water to be used in case of fire have been provided at convenient spots near all the principal buildings of the Lawrence Asylum at *Sanáwar*.
70. The new Zillah School at *Hoshiárpúr* was completed. Hoshiárpúr.
71. Work on re-roofing the Zillah School at Núrúpúr, in *Kángra*, was commenced, but much progress was not made in consequence of an outbreak of cholera in the town. Kángra.
72. Two school-houses were built in the *Gurdáspúr* District. Gurdáspúr.
73. Four new school-houses were nearly completed in the *Amrít sar* District. Amrít sar.
74. Materials were collected for the new College at *Lahore*, and the foundations of the building were marked out, and partly excavated at the close of the year. The new College will occupy the site hitherto covered by the old barracks, &c., which had for some years indifferently served the purposes of the Medical School and Charitable Dispensary. Lahore.
75. Alterations and additions to the old barrack occupied by the Office of the Director of Public Instruction, the Inspector of Schools, and the Government Book Depôt, were completed.
76. The Dharmkót school in *Fírozpúr* District was completed. Fírozpúr.
77. A school was built at Tolambá, in the *Multán* District. Multán.
78. The Kúllar school was enlarged, and two new schools were built in the *Ráwalpindí* District. Ráwalpindí.
79. Improvements were made to two schools in the *Bannú* District. Bannú.

## GENERAL.

80. A rest-house for Civil Officers on tour was purchased at Dháman, on the banks of the Ghaggar, in the *Sirsa* District, where it was much needed. Sirsa.

## BUILDINGS.

Hissár.

81. The renewal of roof of the Church at *Hissár* was completed, and some furniture which was required was supplied. A public dispensary was established at *Hissár* by extending the Customs' dispensary there.

Karnál.

82. Improvements were made to the dispensaries at Karnál, Kaithal and Kunjpúrah, *Karnál* District.

Simla.

83. An apse was added to the Church at *Simla*, and some other additional accommodation afforded by including the former Vestry and Church Library. A new vestry was built at the north-east corner. The Church Library has been removed to an adjacent building.

Dharmśálah.

84. A chancel for the Church at *Dharmśálah* was sanctioned, and the work put in hand. The new tower to the Church was finished, and the flooring, &c., of the tower was in progress. The west end gallery had been removed, and a window inserted. Some new furniture for the Church was in course of preparation.

Dalhousie.

85. The construction of the new Church at *Dalhousie* was taken in hand by the Executive Engineer of the Military Works Branch at that place, no Officer of the Provincial Establishment being available within a convenient distance. Materials were collected, the foundations dug, and the timbering for doors and windows prepared.

86. The enclosure wall of the cemetery at *Bakloh* was completed.

Gurdáspúr.

87. A dispensary was built at Kalánaur in *Gurdáspúr* District.

Amritsar.

88. The work on the large block of City buildings at *Amritsar* was brought to a close. The buildings contain a large town-hall, accommodation for a Small Cause Court, City Police, &c., and other Municipal requirements. They are constructed of brick masonry, with a slate roof.

89. Improvements were made to the *Amritsar* dispensary under the supervision of the Civil Surgeon.

Lahore.

90. The vaulted roof of the "Montgomery Hall" at *Lahore*, erected seven years ago, by subscription, in honor of Sir R. Montgomery, having given indications of failure, the Government decided to take charge of its renewal, to dismantle it, and to substitute for it a new roof of lighter construction and design. The old roof has been supported, and awaits the completion of the arrangements for putting on the new one.

91. A few additions and improvements were made to the "Mayo Hospital" at *Lahore*.

92. The dispensary at *Lahore* has been removed from the site chosen for the new College to a building near the sadr

## BUILDINGS.

bázár in *Anárkali*, which has been enlarged and improved for that purpose, quarters being provided for the Apothecary in charge. Lahore.

93. New verandahs were constructed on three sides of Government House at *Lahore*, similar to those formerly constructed on the other sides. New out-offices, with some latrines, in the Government House compound, were also in progress.

94. A lunatic ward was added to the *Gujránwála* dispensary. Gujránwála.

95. A dead-house was built near the *Ferozpúr* dispensary, and additions were made to the Sub-Assistant Surgeon's quarters. Ferozpúr.

96. Materials for rest-houses for Civil Officers on tour were collected at Chiniót and Shorkót in the *Jhang* District. A shed for suitors was in progress at *Jhang*. Jhang.

97. The lunatic ward near the *Multán* dispensary was completed, accommodation was provided for European and female patients, and other improvements were made to the dispensary. A dispensary was also built at Jalálpúr in the *Multán* District. Multán.

98. A new dispensary was built at Pahárpúr, and additions were made to the dispensary at Bhakkar, in the *Derah Ismail Khán* District. Derah Ismail Khán.

99. A building for the Forest Office at *Jhelam*, commenced in the previous year, was finished. Jhelam.

100. An estimate was sanctioned for a sessions house at *Jhelam*, and materials were collected, and the work commenced.

101. Progress was made in constructing a new dispensary hospital at Pind Dádan Khán, in *Jhelam* District, and additions were made to the dispensaries at Chakowál and Talagang.

102. The superstruction of a new dispensary at Pindí-Gheb, in *Ráwalpindí* District, was completed, and the roofing was in progress. A hospital was provided for European patients at *Ráwalpindí*. Ráwalpindí.

103. An enlargement of the cemetery at *Mirree* was commenced, and made some progress. Mirree.

104. Improvements and additions were made to the dispensaries at Edwardesabád, Lakkí and Míanwálí, in *Bannú* District. Bannú.

105. A rest-house at Chirát was purchased for the use of Civil Officers of the *Pesháwar* District. Pesháwar.

## COMMUNICATIONS.

## Communications.

## METALLED ROADS.

Dehli to Mathrá.

106. The bridges and culverts on the Punjáb portion of the *Dehli* and *Mathrá* Road, as far as *Kaúlí*, except the bridge over the *Búríápul Nallah*, were brought to completion this year. Metal was collected for 19 miles of the road from the *Okla* junction.

Dehli to Bahádurgarh.

107. The metalling and improvement of the road from *Dehli* to *Bahádurgarh* (to *Rohtak* and *Sirsa*) was completed with exception of  $1\frac{1}{2}$  miles consolidation of metal and 4 miles dressing of earth-work.

Dehli to Ambálah and Lahore.

108. The Grand Trunk Road from *Dehli* to *Ambálah* and on through *Amrísar* to *Lahore* was maintained in good order. A new coat of metal was provided in several miles of the road; the plantations were attended to, and about 5000 more trees planted along the roadsides.

109. The River *Tángri* had, near *Sháhpúr*, cut through the embankment of the Grand Trunk Road, and made a breach of nearly 1300 feet in length. A metalled crossing was constructed across the gap. A new metalled crossing of the *Sukhná* river was completed.

110. In the *Biás* Valley metalled causeways were made over the *Akvi*, *Ramidi* and *Ambowal* streams. The *Ramidi* and *Ambowal* causeways were completed, and that over the *Akvi* was in progress.

111. The diversion of the Grand Trunk Road at the Cantonment of *Jálandhar* was completed.

Ambálah to Jagádhrí.

112. The *Ambálah* and *Jagádhrí* Road, from *Shahabad* near *Ambálah* to the right bank of the *Jamná*, which had suffered severely from the effects of the heavy floods in 1871, was lowered, the check of the drainage having caused excessive rush through the bridges, five of which were carried away. Eight metalled depressions of an aggregate length of 8325 feet were made,—and a low level bridge across the *Rakshí* torrent. The metalling of six miles of the road between *Jagádhrí* and the *Jamná* was completed.

113. *Kíkar* seeds were sown along one mile of the road, and over 4000 young trees planted.

Ambálah to Kálká.

114. The *Ambálah* and *Kálká* Road was re-metalled where necessary, and repaired throughout. A metalled gap was made for the passage of flood-water in the 23rd mile.

Ludiánah to Fírozpúr.

115. The road from *Ludiánah* to *Fírozpúr* was kept in order, and the road-bungalows and bridges along it put into thorough repair. After excessive rain in July several breaches

## COMMUNICATIONS.

were cut in the road. Metalled depressions, about 3000 feet in length, were made. Fifty-one miles of this road received a new coat of metal.

Ludianah to Firozpur.

116. The road from *Jalandhar* to *Hoshiarpur* was maintained in good order. A metalled gap on the *Nasirala* Nallah which crosses the road was renewed.

Jalandhar to Hoshiarpur and Dharm-sala.

117. The road from *Firozpur* to *Lahore* was kept in order and metal collected.

Firozpur to Lahore.

118. The metalling of the road from *Multan* to *Shereshah* on the right bank of the *Chinab*, was in progress.

Multan to Shereshah.

119. The road from *Lahore* to *Jhelam* has been kept in repair by the Officers of the *Punjab Northern Railway*, which is being constructed on one-half of the road.

Lahore to Peshawar.

120. On the section between *Jhelam* and *Rawalpindi* the usual repairs were executed, and metal collected.

121. Between *Rawalpindi* and *Attock* protective works along the road at all dangerous points were in progress. Beyond *Attock* and on to *Peshawar* a new coat of stone metal was consolidated on  $15\frac{1}{2}$  miles of the road, and materials were collected along 24 miles for a second layer.

122. Stone was collected for the metalling of a small portion of the road from *Kohat* to *Edwardesabad*, extending from the *Kohat* Cantonment to the river *Towy*.

Kohat District.

## UNMETALLED ROADS.

123. The removal of the overhanging portion of cliff at *Tara Devi*, near *Simla*, on the *Kalka* and *Simla Road*, which was commenced in the previous year, was completed. Nearly a mile of bad part of the cart-road was metalled to make it fairly passable during the rains.

Kalka to Simla.

124. The special repairs rendered necessary by the heavy rains of 1871-72 were finished during the year, the surface and surface-drainage were improved and a side channel made along the inner edge of the road throughout its entire length. The land-slips along the road during the year, though not so great and frequent as in the previous year, gave some trouble. In August 1872, about 100 running feet of the road, in the 7th mile, subsided three feet. On one occasion during the year was the road closed for about 24 hours by a large land-slip in the 39th mile. The passage of traffic remained otherwise unimpeded except in a few instances for short times.

125. Drains liable to be choked are being improved. At some of the places most liable to land-slips breast-walls and catch-water drains are being made; in other parts catch-water drains only. Many of the catch-water drains were completed,

## COMMUNICATIONS.

Kálká to Simla. about a third of a mile of road protected by breast-walls and 83 cross drains, aggregate water-way 338 feet, have been finished.

126. Retaining walls, to an aggregate length of 5262 feet, have been re-built.

Kálka to Simla  
via Kasowli.

127. The old road to *Simla via Kasowli* was kept in fair order. An iron wire rope was thrown across the Kathar Naddí between *Kasowli* and *Sabáthú*, by which the mails can be quickly taken across during heavy floods.

128. The branch roads to the stations of *Kasowli*, *Sabáthú* and *Dagshát* were also kept in repair.

Hindústán and  
Tibet Road.

129. The road from *Simla* up the Satlaj Valley was kept open to Pángí, a distance of 150 miles. An improved line to Fágú was marked out and surveyed.

Kángra Valley  
Road.

130. The old road from *Pathámkot* to *Núrpúr* has been extensively improved. Culverts were made and gradients reduced. From *Pathámkot* to the *Chakki* little remained to be done but the dressing of the side slopes. The *Chakki* River presents the only great impediment to cart traffic. It is proposed to facilitate the crossing of the *Chakki* by opening a clear passage across the bed of the stream, to be renewed annually by the removal of boulders, &c.

131. Paved crossings of the Grel and Bhúd streams are in progress. Between *Núrpúr* and *Bandarghát*, the *Bher Khád* paved crossing was nearly completed. On the completion of this crossing, and those over the Grel at *Kijjiar*, for which materials were collected, the cart-road will be open to *Kotlah*. Some heavy masonry retaining walls in this section were built, the embankment or right approach of the *Dehri* bridge at *Kotlah* was partially finished, and between *Kotlah* and *Bandarghát* a number of minor bridges, culverts, &c., were in progress.

132. On the next section, between *Bandarghát* and *Baijnáth*, the incline near *Bandarghát* was cleared and excavated to full width, and several minor bridges and culverts were under construction.

Hoshiárpúr to  
Dharmśálah.

133. The road from *Hoshiárpúr* to *Dharmśálah* was maintained in good order, and the bridges and retaining walls repaired.

134. For the *Chaitrí* bridge, 84 feet span, between *Kángra* and *Dharmśálah*, materials were collected, the foundation excavated and masonry commenced. The excavation for the left abutment foundation, in boulders and water, was a work of great difficulty.



## COMMUNICATIONS.

135. The improvement of the road from *Pathánkót* to *Dalhousie* was in progress. During the year 46 extra drains were made between *Pathánkót* and *Danerá*, and the whole road was properly dressed and kept in repair.

*Pathánkót* to *Dalhousie*.

136. The first section of the road, *Lahore* to *Shekopúra*, (20 miles) is finished. On the second section, to the *Chinab*, beyond *Pindí Bhattián*, the earth-work, 3 drain bridges, and a metalled gap were completed.

*Lahore* and *Sháhpúr* Road.

137. The first 24 miles of the *Siálkót* and *Gurdáspúr* road have been completed, with 22 masonry bridges and five metalled gaps.

*Siálkót* to *Gurdáspúr*.

138. The road from *Jháng* to the *Chícháwatní* Railway station, on the *Lahore* and *Multán* Railway, was improved, and a mail-cart has for some time been running between these places.

*Jháng* to *Chícháwatní*.

139. The drains and culverts on the road from *Derah Ghází Khan* to *Mithankót* were in progress.

*Deráh Ghází Khán* to *Mithankót*.

140. More parapet walls, &c., were built on the road from *Ráwalpindi* to *Murree*, others remain to be done. The usual annual repairs to the road were executed.

*Ráwalpindi* to *Murree*.

141. A detachment of the 23rd Pioneers was employed on the improvement and widening of parts of the road from *Murree* to *Abbottabad*. The usual annual repairs were carried out, and special repairs executed where necessary to the masonry and wooden bridges along the road.

*Murree* to *Abbottabad*.

## DISTRICT ROADS.

142. The roads from *Karnál* to *Jagádhri*, towards *Sáháranpúr* and towards *Meerut* were partially raised, and progress was being made in metalling the *Sáháranpúr* road, and in raising and bridging other District roads.

*Karnál*.

143. The metalling of two miles of the main *Dehli* road between *Hissár* and *Hansí* was nearly completed, and a section of the *Bhiwáni* road was raised.

*Hissár*.

144. A gap was constructed on the road from *Amritsar* to *Siálkót*, and extensive repairs made to this road and other important District roads.

*Amritsar*.

145. In the *Gurdáspúr* District three bridges on the *Behrámpúr* road were completed; the roads from *Pathánkót* and *Mádhopúr* to *Sháhpúr*, and low portions of the roads from *Deráh Nának* to *Gurdáspúr*, *Batálá* and *Fattehgarh*, and of

*Gu dáspúr*.

## COMMUNICATIONS.

- Gurdáspúr.** the roads between Batálah and Fattehgarh, and Batálah and Srí Gobindpúr, were raised, and bridges constructed for the drainage under them ; and improvements were made to other District roads.
- Gujránwála.** 146. Gaps and bridges were constructed on various District roads in *Gujránwála*.
- Derah Ismail Khán.** 147. Several unmetalled roads, 71 miles long, were constructed in the *Derah Ismail Khán* District ; and a masonry bridge on the road from Derah Ismail Khán to Band.
- Ráwalpindi.** 148. The roads from *Ráwalpindi* to *Házará*, *Nírúpúr*, *Sydpúr* and *Chauntrá*, from *Hasan Abdál* to *Usmán Khatár*, and from *Mandrá* to *Chakowál*, were bridged in 19 places.
- Sháhpúr.** 149. The bridge over a hill torrent on the Sodhi and Katwái road in the *Sháhpúr* District was completed ; and mile-posts were erected along the Khusháb and Sukesár road.
- Bannú.** 150. Bridges were built on the road to Akrá, Howaid, Mírián, Gaumtí, in *Bannú* district.
- Pesháwar.** 151. The road from *Pesháwar* to *Mardán*, and the road from the cattle market at *Pesháwar* to the Sháhi Bágh, were raised ; and extensive repairs and improvements were made to the roads of the district.

## BRIDGES.

- Ambálah to Jagád-hari.** 152. The bridge over the Western Jamna Canal, on the *Ambálah* and *Jagád-hari* road, was completed and opened for traffic. During the year, the ghauts, tow-paths, the greater portion of the earth-work and the wooden superstructure were executed.
- Dehli to Ambálah.** 153. On the Márkandá River, near the bridge on the Trunk Road, a screw pile spur, 600 feet long, was constructed to divert the main stream from the right abutment of the bridge which it threatened. The river threatened to break the bund which protects the town of Sháhábád, and had to be checked by additions to a tree spur a little further up. The highest flood of the year, 12th August, gave a depth of 11 feet of water under the bridge, with a velocity of 9 feet per second.
- Kángra Valley Roads.** 154. On the line of the *Kángra Valley Road* several bridges were in progress.
155. The Dehri bridge at *Kotla*, timber bow, 214 feet water-way, was completed ; and a dry masonry defence work for the right abutment was constructed.

## COMMUNICATIONS.

156. The *Brál* bridge, stone, 84 feet span, was finished, except the capping of the portions over the wing-walls.

Kangrá Valley  
Roads.

157. Of the *Neri* bridge, 27 feet span, the abutments, arch and backing were finished. Parapets and approaches were in progress.

158. Materials were collected for the *Seon* bridge, three spans of 28 feet.

159. A temporary crossing was made over the *Ladwára* Stream.

160. The *Kholí* bridge, brick, 40 feet span, is nearly completed.

161. The protection of the *Buner* bridge abutment had been partially done before the rains, but the floods undermined what had been done and the work was re-commenced.

162. A large quantity of minor bridge and culvert work is in progress.

163. The bridge over the *Leh* stream on the road to *Murree* was extensively repaired.

Ráwalpindi and Mur-  
ree Road.

164. The *Ujri* bridge was also renewed, and the construction of a protective piling was in progress.

165. The substitution of permanent bridges for the old temporary wooden ones between *Ráwalpindi* and *Murree* was continued.

166. The iron suspension bridge over the *Jhelam* at *Kohálá*, on the road to *Kashmír*, was completed.

Murree to Kashmír.

167. The *Jábhá* bridge, on the *Hazára* trunk-road, was finished.

## BOAT-BRIDGES AND FERRIES.

168. Early in July 1872, two of the piers of the Railway bridge over the *Satlaj* at *Phillour* were carried away by floods, which rendered necessary the re-construction of a bridge of boats till the Railway communication should be restored. Boats and superstructure were brought up the river from *Fírozpúr*: the annual construction of the boat-bridge there being made to yield to the more pressing necessity for the bridge at *Phillour*, which, with metalled causeways where necessary in the bed of the river, was completed and opened for traffic on the 3rd October.

Trunk Road between  
Ambálah & Lahore.

169. Soon after the bridge of boats across the *Satlaj* at *Fírozpúr* was also completed.

170. The bridge of boats over the *Rávi* at *Sháhderah* near *Lahore* was maintained in good order, and kept up throughout the year. It is the only one of the boat bridges which is not dismantled during the flood season. Superstructure for a double roadway was nearly finished.

Sháhderah near  
Lahore.

## COMMUNICATIONS.

Pind Dádan Khán.

171. New superstructure was provided for the bridge of boats over the River Jhelam near *Pind Dádan Khán*, and materials were collected for the construction of some new boats, &c.

Attok to Pesháwar.

172. The bridge of boats over the Indus at *Attok* was maintained as usual, and the east approach to the bridge improved.

173. Two new boats were provided for the *Attok* ferry.

## RIVER IMPROVEMENTS.

Upper Indus Conservancy.

174. The Punjab Government Steam Flotilla having been abolished, it was not considered necessary to maintain the River Conservancy Establishment for the improvement of the navigable channels of the Indus, and it has since been broken up. It was decided that the ordinary traffic on the Indus, apart from the Steam Flotilla, did not demand the maintenance of a Department of River Conservancy. Before the establishment was discharged some work had been done in the way of manufacture of ropes and yarn, construction of Deodár stakes and blocks of shísham for blasting work and for shore-tackle, &c.

175. The conservancy boats and stores were made over to the Executive Engineer at *Derah Ismaíl Khán*, and the buildings of the Department have been appropriated for other Government purposes.

## ACCOMMODATION FOR TRAVELLERS.

Sirsa.

176. The sarái at *Naráil*, in *Sirsa* District, was completed.

Kángra.

177. Some additions and improvements to the dák bungalow at *Núrpúr* were in progress.

Lahore.

178. The encamping ground, well and sarái at *Múndiáli* in the *Lahore* District, were completed. The sarái has been built on the new general plan, accommodation for European travellers being omitted, as a road bungalow exists close at hand.

Ráwalpindi.

178. A sarái was built at *Káhutá*, a travellers' shed near the *Lachmán* ferry on the road to *Kashmír*, and a well for travellers at *Chur*, in the *Ráwalpindi* District.

Derah Ghází Khán.

180. A staging bungalow was constructed at *Battesar*, in the *Deráját*. A sarái and well at *Sakht Sarwár* were also in progress.

## COMMUNICATIONS.

181. The dāk bungalows at *Leiah*, *Kolácht*, *Yárrak* and *Karór*, in the *Derah Ismail Khán* District, were enlarged. A paccá tank was constructed on the road from *Panniálah* to *Sheikh Budín*, which is reported to be a great boon to the people.

*Derah Ismail Khán.*

182. Two small rest-houses were constructed during the year along the line of road from *Murree* to *Abbottabád*. One at *Dúngá Galí* and the other at *Bagnetár*.

*Hazára.*

183. The construction of a sarái at *Abbottabád* was commenced.

184. A room was added to the Dāk bungalow at *Pezú*, and a sarái was built at *Lakki* in *Bannú* District.

*Bannú.*

## Miscellaneous Public Improvements.

## Mis. Pub. Impts.

185. New roads, drains and canal water-courses were constructed at *Dehli*, and new temporary latrines ; and additions were made to the vegetable market. Additions were made to the *Dehli* menagerie. A survey was made of the city and suburbs, which is expected to be of use in connection with the proposed water-supply and drainage schemes.

*Dehli.*

186. Streets in the towns of *Rohtak*, *Jhajjar*, *Berí*, *Bahádurgarh* and *Khárkhaudá* were metalled ; a ditch round the town of *Berí* was filled and a road made ; a new gateway was constructed at *Bahádurgarh*, and 14 new gateways at *Berí*.

*Rohtak.*

187. Six iron-railed doors were made to the principal entrances into the town of *Bhiwáni* ; slaughter-yards were constructed at *Bhiwáni* and *Hissár* ; a compound wall was made to the *Hissár* town-hall, the drainage of *Hissár* and *Bhiwáni*, and the suburbs of *Hánsí*, were improved ; metalled roads were made in *Hánsí* and *Fatehabád* ; and 22 of the most important drinking wells at *Hissár* and *Bhiwáni* were cleaned out and repaired.

*Hissár.*

188. A nallah leading to the *Bahádurá* tank at *Sirsa* was cleared and deepened, and masonry walls on two sides of the *Gúrúsar* tank were nearly completed ; streets of *Sirsa* and *Ellenabád* were raised ; drains and bridges were constructed in *Sirsa* ; and a tank outside of the town of *Rániá* and a well inside were in progress.

*Sirsa.*

## MIS. PUB. IMPTS.

Sirsa.

189. Materials were collected for a paccá well at a site selected for a new village in place of Khariál in *Sirsa* District, which is very unhealthy owing to inundation of the Ghaggar.

Karnál.

190. Streets of *Karnál* and *Pánápat* were paved, a well was constructed in the *Karnál* sadr bázár, and existing wells were covered over, and the road round Kaithal was raised.

Ambálah.

191. The construction of three wells in the bed of the River *Tangrí*, above *Ambálah*, as an experimental source of supply of water to the city, was completed.

Jálandhar.

192. New pavements were laid down in *Jálandhar*, six commodious masonry latrines were built, and a new masonry inlet was made for increased supply of water to the *Dábí taláo*, much used by the citizens for bathing.

Hoshiárpúr.

193. A Committee-house was in progress at *Tandáh*; and new public necessities were built at *Hoshiárpúr*, *Hariánah*, and *Garhdivála*.

Gurdáspúr.

194. The protective works in the River *Raví*, near the town of *Derah Báábá Nának*, to protect the town from the encroachments of the river, were extended. About 4000 running feet of spurs were constructed.

195. A furnace and verandah were supplied to an experimental sugar-mill at *Dínanagar* in the *Gurdáspúr* District.

Amritsar.

196. The renovation and improvements of the *Rambágh* at *Amritsar* were continued.

Lahore.

197. New public necessities were built at *Lahore*, *Chúnian*, and *Khemkarn*; a new bathing ghát for women was constructed near the *Taxálí* gate of *Lahore*; various improvements were made in the public gardens at *Lahore* and *Raiwind*, and streets of *Khemkarn* and other towns were paved.

Firozpúr.

198. A road from the *Amritsar* gate of *Firozpúr* to *Bágh Ali Sháh* was metalled; the *Firozpúr* town-hall was completed and furnished, and a garden laid out near it; further progress was made with preparation of materials for the masonry tank at *Dharmkót*; streets in *Firozpúr*, *Ziráh* and *Makhú* were paved; new wells and water-courses along roads were constructed at *Firozpúr*, four latrines at *Muktsar* and gates to two smaller towns.

Montgomery.

199. The Committee house at *Kamáliá* was still in progress, delay having been occasioned by the substitution of a paccá for a katchá-paccá building. Streets of *Kamáliá* and *Dipálpúr* were being paved.

## MIS. PUB. IMPRS.

200. In the City of *Multán* streets were paved and side drains constructed. The paving and drainage of the street from Chak bázár to the Dehli gate were completed. Similar works in the street from Masjid Walí Muhammad to the Bohar gate were also finished. The re-metalling of the road from the centre street of the Sadr bázár to the Bohar gate was completed ; a new road was made from the Hiran gate of the city to the road leading from Fort to Cantonments. Other roads were metalled or bridged ; and seven latrines were constructed. Streets of *Kahrór* were paved, a tank was made, and the town and suburbs otherwise extensively improved ; streets of *Tolambá* were paved and three latrines were constructed ; and two latrines were constructed at *Khánpúr*.

Multán.

201. Main streets were paved in the town of *Derah Ismail Khán*, and the metalled road round the town was completed ; a gateway and out-offices were built for the Municipal Court-house. Latrines were constructed at Koláchí and Leiah.

Derah Ismail Khán.

202. Materials were being collected for an embankment to protect the town of *Jhelam* from the river ; it is proposed to construct convenient bathing gháts on the river bank along its base. Streets of *Jhelam*, *Pind Dádan Khán*, *Chakowál* and other smaller towns were paved ; a paccá ghát was made to the new tank at *Pind Dádan Khán*, and drains and bridges were constructed in this town.

Jhelam.

203. The metalling of *Sháhpúr* station roads was completed. The town wall of *Bherah* was completed, and streets were paved, and a paccá tank was constructed near the Lahorí gate of the town. The circular road of *Miání* was completed. At *Sáhtwál* the town wall was completed, and streets were paved, and an addition made to the sarái. The town wall of *Khusháb* was also completed, and streets of the town were paved.

Sháhpúr.

204. Materials were collected for a new bridge over the *Leh* near *Hukmá Singh's Sarái*, on the road from the town of *Ráwalpindi* to the Grand Trunk Road to *Pesháwar* ; a Committee room was built at *Attok* ; roads at *Ráwalpindi* were metalled, and streets of *Hazro*, *Káhtá*, *Kallár* and *Sukhó* were paved ; tanks were made at *Sukhó* and *Kallár*, and new latrines at *Husan Abdál* and *Ráwalpindi* ; a large flood drain of masonry, 924 feet long, was made skirting the *Kashmíri bázár* at *Ráwalpindi*.

Ráwalpindi.

## MIS. PUB. IMPTS.

Bannú.

205. Some streets of the town of *Bannú* were metalled, and others paved, and drain bridges were constructed. A bridge was built in *Kálábágh*, and improved sun-shades were erected to shops in *Lakkí*.

206. A masonry bund was made at *Bergí* in the *Bannú* District, forming a tank in which there were 10 feet of water at the end of the year, the only water for a distance of 20 miles along a treeless road. Another tank was begun at *Sháhbázkhel*, on the high road to *Derah Ismail Khán*, in a waterless part of *Marwát*.

Pesháwar.

207. Extensive improvements were made to the *Wazír bágh*, much resorted to by the citizens of *Pesháwar*; high unsightly walls were thrown down, bringing out into view the stately cypress trees; masonry tanks were cleared out, and a curious garden house restored. Various sanitary improvements were effected in the neighbourhood of the *Panjtíráth* shrine. About  $11\frac{1}{2}$  miles of masonry drains, in continuation of the scheme for the drainage of the city described last year, were constructed; cess-pools were filled up; 105 wells in the city were cleaned and improved; the circular road was raised; the cattle market was improved; 14 gateways were constructed, and a slaughter-house. Part of the city wall was re-built; mounds and old kilns outside the city were levelled, and portions of streets were metalled.

## IRRIGATION.

## PART III.—(IMPERIAL) IRRIGATION.

BARI DOAB CANAL.

208. In the revenue-paying Divisions the work carried on during the year was almost entirely in the ordinary maintenance operations of repairs to works and channels, and silt clearances.

1st Division.

209. *Original Works*.—Boundary pillars were erected along the canal and all *rájbahás*; only the lands occupied by the old *Haslí* Canal and a few outlying plots remain to be thus demarcated.

210. *Repairs*.—No floods of any great magnitude occurred in the *Ráví* or hill torrents during the rainy season of 1872, so that the embankment work for maintaining the canal-supply and repairs to the torrent diversion works were less than usual.

211. The canal was closed for repair and clearance for a month during January and February. Most of the rapids were found to require repair, more or less, but not to the same



## IRRIGATION.

BARI DOAB CANAL.  
1st Division.

extent as in former years. The repairs to the banks and bed in the sandy tract, executed during the previous year, had stood well, and required little addition.

212. The lengths of channels cleared during the year were as follow :—

Main canal ... ..	1 mile.
Distributaries ... ..	67 miles.
Navigation channel ... ..	6 „

213. During the closure the open channel through which the canal-supply has hitherto been drawn from the Rávi was closed ; and, on the termination of the closure, the water was admitted into the canal channel through the new masonry inlet on the left flank of the permanent weir.

214. This is the first instance in Northern India of the regulating head of a canal situated in the boulder formation being constructed on the main channel of the river, so that there is more than ordinary interest attaching to this work. The effect will be carefully watched.

215. The Rávi was at its lowest on the 19th December 1872, when the measurements showed a discharge at the canal head of 1865 cubic feet per second, rather above the average of past years.

216. *Plantations.*—Besides the usual maintenance operations, 240 young trees were planted out. The aggregate area under plantations in this Division is 2904 acres.

217. *Biás embankment.*—This embankment to protect the low lands of the Kánowán Chamb, alluded to in last year's report as having suffered very severely from the extraordinary floods of that year, was repaired and in part renewed at a cost of Rs. 12,949. No flood of sufficient height to test its stability occurred during the year.

218. *Original Works.*—One new distributary, the Hindal, of small dimensions, four miles in length, near the termination of the central line, was completed during the year, at a cost of Rs. 2,541. 2nd Division.

219. The substitution of permanent irrigation outlets for the wooden tubes formerly in use was proceeded with during a portion of the year, when operations were suspended until an accurate register could be prepared of the areas to be provided for in each case.

The number constructed during the year ... ..	359
Total do. do. up to date ... ..	3,798
Total number estimated for ... ..	7,515

220. The preparation of the register is now well in hand, and will, it is expected, be completed in the course of two or three months.

## IRRIGATION.

BARI DOAB CANAL.  
2nd Division.

221. The erection of boundary pillars to demarcate the lands appertaining to the canal was completed during the year.

222. *Repairs.*—The length of main canals kept in order during the year was as follows :—

Central line	...	...	...	98 miles.
Lahore Branch	...	...	...	63 "
Total	...	...	...	156

## Of distributaries—

Cleared of silt	...	...	...	160 miles.
Repaired generally	...	...	...	496 "

223. During the closure in January and February, large quantities of deposits, aggregating 686,783 cubic feet, were cleared from the channel of the main canals. The masonry works generally were found to be in good order.

224. *Plantations.*—Besides the usual maintenance operations, 5500 young trees were planted out along the canal lines, in addition to a number in the canal bungalow compounds. Two new nurseries, four acres in extent, were formed. About 78 acres are under cultivation as fuel plantations. An accurate measurement is being made of every plot, large or small, available for planting, with the view of systematizing the annual planting operations.

## 3rd Division.

225. Comprises the Kasúr and Sabraon Branches under construction. Expenditure from Loan Funds.

## 226. Excavation of channel—

		Kasúr Branch.	Sabraon Branch.
Total length	... miles	90	67
Length completed	...	102	
Ditto in progress	...	41	
Excavated to close of year	... cubic feet	65,480,896	57,958,791
Ditto during year	...	8,681,979	4,981,267

227. The excavation of the main channels is now nearly complete, the alignment of the terminations having been decided on, and the work there set in hand during the year.

228. It was at first intended to tail these Branches into some of the distributaries from the central line of the Bári Doáb Canal, with the view of economizing all surplus water to the utmost; but this, after an exhaustive examination of the localities, has been found to be impracticable, and the escape water, it is decided, must pass into the adjoining natural drainage lines.

229. *Masonry Works.*—The progress on these hitherto has been slow, owing to the delays involved in revising the whole of the designs and estimates, and other causes. The revision has resulted in a large saving on the original estimates.

## IRRIGATION.

BABI DOAB CANAL.  
3rd Division.

230. One first class inspection house, which will also be the head-quarters of a Sub-division, was completed by the close of the year ; 10 other inspection houses were in progress.

231. Of the bridges, three ordinary, and the regulating heads at the bifurcation of the two branches, were commenced. The revised designs and estimates for several others were prepared, and have since been sanctioned, the principal materials being already collected at the sites.

232. Detailed estimates for the distributaries are being prepared.

233. The following quantities of the principal building materials have been collected :—

				<i>Bricks.</i>	<i>Lime materials.</i>
				No.	Cubic feet.
During the year	...	...	...	776,480	39,780
Up to close of year	...	...	...	4,842,830	158,235

Now that the preliminary difficulties have been got over, the progress of the works may be expected to be rapid. Contractors have at last been obtained for a large number of the works.

234. All work connected with the completing of the Bári Doáb Canal new head works, &c., is comprised in this Division.

Special Works Division.

235. *Ravi Weir and Head Works.*—The portions of these works remaining unfinished at the close of the previous year were completed in all essential points during the year under review. The piers of the escape sluices in the weir were built, and the necessary gates and appliances for them and the canal inlet were nearly completed, and have since been finished.

236. The supply of water for the canal, as mentioned above, was admitted through the new inlet for the first time in February last.

237. The only part of the revised design left untouched is the raising of the crest of the weir towards the right flank, with the view of diverting the main stream to the left flank where the canal inlet is situated. If the boulder embankments which have been lately constructed with this object a little higher up the course of the river are found to answer their purpose, this addition to the weir will be unnecessary. One season of high floods will settle the question. No flood of any magnitude having occurred during the rains of the year under review, the works have not yet been fairly tested.

238. *Remodelling Main Canal between the Kasúr and Lahore Branch bifurcations.*—Work on this project has been suspended pending the completion of, and sanction to, a revised estimate.

## IRRIGATION.

BARI DOAB CANAL.  
Special Works Division.

The delay in submitting this estimate is owing to the necessity of showing accurately the total amount likely to be required in completing the canal project, of which the remodelling of this section formed only one item. Without detailed estimates for each individual portion no reliable approximation to the probable aggregate expenditure is possible. The whole completion scheme, both as regards the irrigation and the navigation, is therefore being elaborated, and will, it is expected, be ready for submission in the course of a few months.

239. Meantime, the progress in collecting materials has been considerable. Up to date the quantities of the two chief requisites are—

							<i>Cubic feet.</i>
Bricks	...	...	...	...	...	...	11,559,000
Lime materials	...	...	...	...	...	...	50,798

so that all is ready at several of the sites to commence work immediately the designs and estimates are sanctioned.

## Workshops.

240. The revised design and estimate for completing these shops on a reduced scale, suited to the requirements of the canals, alluded to in last year's report, were sanctioned in time to commence the necessary buildings at the close of the rainy season.

241. For this purpose the saw-mill buildings are being added to, and adapted for, the reception of the machinery, the motive power being the water-wheel erected originally to work the saws.

242. Fair progress was made by the close of the year in the buildings required.

						<i>Cubic feet.</i>
The total quantity of masonry is	...	...	...	...	...	84,841
Executed during the year	...	...	...	...	...	88,614

or about one-half of the aggregate.

243. The quantities of iron-work executed in the shops were in excess of those of the previous year.

244. They were—

Castings	...	...	...	...	1038 maunds.
Wrought-iron...	...	...	...	...	618 „

245. The iron-work for the new weir and head works on the Rávi, and a quantity of miscellaneous articles were also turned out during the year.

246. Some of the heavy wrought iron-work was for the Dalhousie barracks and the Kangra road bridges.

247. The cost of the outturn both of castings and wrought-iron shows a satisfactory decrease on the average of previous years.

## IRRIGATION.

WESTERN JAMNA  
CANAL.

248. The operations in the revenue-paying divisions of this canal were, as on the Bári Doáb Canal, chiefly confined to ordinary maintenance and clearances.

249. *Original Works.*—A portion of the cut across one of the old heads on the main line, at the crossing of the Ambálah and Sáháranpúr Road, was completed during the closure in the month of January.

Karnál Division.

250. The escape from the Dehli Branch bifurcation at Ráir was completed according to the original design.

251. Preparations were made for commencing a new inspection house, long since much required on the main line at the crossing of the Punjáb Railway. Materials were collected and land taken up.

252. *Repairs.*—The repairs to the temporary bunds for the maintenance of the canal supply were less than usual, no floods of any great magnitude having occurred during the year.

253. At the permanent head works at Dádúpúr, the two piers of the dam carried away in the previous year were rebuilt, and other damages also due to the floods of that season repaired.

254. The loss of several of the piers of this dam (originally constructed in 1833) during the last few years is attributable mainly to logs of fir wood brought down in high floods. Formerly only sál and similar timber was cut in the hills in the valleys of the Jamná or its tributaries, this being heavier than water was always floated down on rafts, but since the cutting of fir also has been commenced, logs, as on the Ráví, are carried down in flood even into the old side channel of the river which carries the canal supply above Dádúpúr. As it was found in one or two instances that the piers were not overturned, but had slipped off the dam flooring, they have been all rebuilt with vertical iron bars extending through the centre into the floor below. None of the piers rebuilt in this fashion have been since damaged.

255. The canal was closed for repairs and clearance from 6th January to 2nd February.

256. Between Karnál and the Dehli Branch bifurcation, extensive raising and strengthening of the canal banks was found necessary to prevent the risk of breaches which had become imminent from the constant erosive action of the stream. A length of 15 miles was thus repaired at an expenditure of Rs. 15,473. This portion of the old canal is always exposed to these risks, which are increased by the vermin holes with which the banks are in places honey-combed, and which the utmost care fails altogether to eradicate.

257. *Plantations.*—The aggregate area of land newly sown with tree seeds during the year was 26 acres. Young trees were planted out on an area of about 3 acres.

## IRRIGATION.

WESTERN JAMNA  
CANAL.  
Dehli Division.

258. *Repairs.*—During the closure in January, the main channel was cleared of silt deposits as far as practicable ; the quantity taken out aggregated 888,000 cubic feet.

259. The clearances of silt from distributaries and water-courses during the year extended over an aggregate length of 214 miles. The Bowaná escape was cleared for a distance of 7 miles.

260. *Plantations.*—The total area in this Division planted out is about 693 acres ; under nurseries about 5 acres. No more land being available for fresh plantations, the year's operations were confined to maintenance of existing plantations.

261. A tilery, for the manufacture of pipes for water-courses outlets on the canal generally, was commenced during the year in this Division. The requisite tile machine was transferred from one of the factories on the Bári Doáb Canal, which was closed on the completion of the operations there.

Dehli and Gurgáon  
Works.

262. These are storage works. Only ordinary repairs during the year.

263. Both on these works, and on the canal line, difficulties have arisen here and there in fixing definitely the boundaries of the canal lands which were occupied for the works many years since. As a revision of the land revenue settlement is now in progress, the opportunity is being taken of having all disputed points settled and the Government title to the lands properly recorded for the future.

Hánsí Division.

264. The demarcation of the boundaries of the canal lands in British territory and in that of the Bikanír State has been completed. In Jhínd, disputes regarding it are still pending.

265. *Repairs.*—During the closure in January, irregular deposits of silt were removed from the canal channels along a distance of 130 miles.

266. The aggregate length of distributaries cleared was 44 miles. One of the second class inspection houses was rebuilt at a cost of Rs 760.

267. *Plantations.*—The aggregate area more or less fully planted in this Division amounts to 3012 acres ; under nurseries about 10 acres. No more land is available here for new plantations.

New Head Works  
Division.

268. Work on the new Hánsí Branch having been stopped, and the construction of the Jamná Dam and new head works for the Western and Eastern Jamná Canals having been sanctioned, the establishment employed on the former was transferred to the new Division indicated in the margin,

and to the Special Survey Division employed in the completion of the other projects connected with the canal.

269. The detailed design and estimate for the new head works, which was submitted for sanction shortly after the close of the previous year, was returned for revision with reference to some alterations in the design, with instructions to push on the construction of the work as rapidly as possible. The new division was constituted from 1st December 1872. The site of the dam and head works was definitely fixed, and by the close of the year a considerable proportion of the necessary shelter for the establishment was completed.

270. The collection of materials for the main works had meantime been vigorously pushed on, and by the end of the year all was ready to commence putting in foundations. No water, strange to say, being found anywhere in the sub-soil along the line of foundations, though close to the running stream of the river. This portion of the work will be carried out with less difficulty than could have been anticipated in such a locality.

271. The quantities of the three chief materials collected were—

	Bricks.	Boulders.	Lime.
	<i>No.</i>	<i>Cubic feet.</i>	<i>Cubic feet.</i>
During the year ... ..	300,000	203,141	11,406
Total to close of year ... ..	300,000	488,227	16,649

272. The revised design has been drawn up as directed, and with all the alterations in detail which the experience obtained on the new works on the Rávi, at the head of the Bári Doáb Canal, have shown to be necessary. The plans with estimate, amounting to ~~Rs~~ 5,64,085, were nearly complete by the close of the year, and have since been submitted for the sanction of the Government of India.

273. The operations in this division comprised the completion of investigations connected with projected improvements, and the designing of the new distributary system under the orders of Government mentioned in last report.

Special Survey Division.

274. In January last, detailed designs and estimates, aggregating ~~Rs~~ 12,30,348, were submitted to the Government of India, for a system of distributaries to supply the irrigation from the main line below Karnál, with the Dehli and Rohtak Branches. Those required on the Hānsí Branch,

#### IRRIGATION.

##### WESTERN JAMNA CANAL.

##### New Head Works Division.

## IRRIGATION.

WESTERN JAMNA  
CANAL.  
Special Survey Division.

in the Jhínd State, forming an entirely separate project, the cost of which will possibly be defrayed in whole or in part by the chief of that State, were excluded from this design. Provisional sanction was accorded in the month of March to the construction of two of the lines, and information called for as to the probable cost of the remaining portions of the project for improving the condition of the canal, the designs and estimates for which were then in hand, and will be submitted shortly. The two lines of distributary to which sanction was thus accorded have since been marked out on the ground, and detailed estimates prepared.

275. On account of the obstructions everywhere presented to the free passage of the surface drainage by the existing net-work of water-courses, the execution of any efficient drainage schemes must be deferred until the completion of the improved system of distributaries, by which the irrigation will be provided for without interfering with the natural drainage out-falls.

276. A report was submitted towards the close of the hot season, embodying the results of the very complete investigations made in the previous year, as to the possibility of storing water in the vicinity of the Ghaggar and Sarsútí Rivers, in the *Hissár* District. The result is not very favorable, and doubts regarding the occupation of the land which would be required, as well as the probable returns on expenditure, which have been referred for the opinion of the Revenue Officers, have hitherto prevented the matter being laid before Government for final decision.

277. A thorough examination of the country in the *Dehli* and *Gurgáon* Districts, with reference to the possibility of storing water there, was completed by the close of the year, the results of which will be reported on ere long. Levels and surveys were taken over the entire area forming the catchment of the *Sahibí nallah* and its feeders.

278. The aggregate lengths of levels and surveys executed in the Division during the year were—

Surveys ...	...	...	...	1,375 miles.
Levels ...	...	...	...	1,428 „

279. The operations extending over an area of about 2,500 square miles.

280. A considerable amount of information required for the new distributary and drainage arrangements, as to areas irrigated, expenditure of water, &c., was also collected during the year.



## IRRIGATION.

INUNDATION CANALS.  
Upper Satlaj Division.

281. These at present consist of four separate channels from the right bank of the Satlaj, in the *Lahore* and *Montgomery* Districts, viz. :—

The Khánwah Canal,	
„ Upper Sohág Canal,	
„ Lower Sohág „	
„ Katora.	
Total length of main channels	... 254 miles.
Ditto of distributaries	... 47 „

282. Only ordinary maintenance operations during the year.

283. The silt clearances extended over distances as follow :—

Main Canals	...	64 miles.
Distributaries	...	47 „
Total quantity of silt excavated	...	23,087,294 cubic feet.

284. The charges to be levied for irrigation from these canals in the *Montgomery* District were under discussion during the year, and towards the close final decision was come to in the Revenue Department that the rate on irrigated land should include both water-rate and the enhancement of land revenue assessable on increased profits from wet cultivation. The want of reliable data for estimating probable returns has hitherto prevented the submission of projects for improving these canals.

285. These are the channels in the *Multán* District.

Lower Satlaj and  
Chináb Division.

286. *Repairs.*—The greater portion of the annual silt clearances was effected as usual by unpaid statute labor.

287. New supply heads to two of the canals, and a portion of the clearance of six others, were paid for from the fine fund.

288. The aggregate length of canal channels is 685½ miles. Silt clearance more or less extended over 543½ miles.

289. The embankment along the Chináb, to protect the city and station of *Multán*, stood the floods satisfactorily. A slight settlement which occurred last rainy season has since been repaired.

290. Channels in the *Derah Ghází Khán* District between the Indus and the Suleimán hills.

Derah Ghází Khán  
Canals.

291. *Embankments.*—The new portion of the Sháh Jamál embankment commenced in the previous year was completed by the 1st May, and stood the floods of the season most successfully, though one of those floods was higher than any in the previous year, when this line of embankment was so extensively breached.

## IRRIGATION.

INUNDATION CANALS.  
Derah Ghází Khán  
Canals.

292. The addition to the Báhar Sháh embankment (opposite the station of *Derah Ghází Khán*) which had also been commenced in the previous year was completed, as far as was absolutely necessary, by the month of August. As the main stream of the river which threatened this part of the bank has shifted to the eastward, the remaining portion of the addition is left for the present.

293. *Repairs to Canals.*—New supply heads were excavated for four of the canals.

294. The annual silt clearances extended over 360 miles of channel, out of an aggregate of nearly 600 miles. The total quantity excavated amounted to 40,900,000 cubic feet, or about 5,700,000 cubic feet more than in the previous year.

295. *Plantations.*—10,000 young trees were planted out during the year.

## SIRHIND CANAL.

296. The completion estimates for this canal were, as stated in last Annual Report, submitted for the orders of Government in February 1872. The opinions of the Revenue Officers on the project were submitted in the month of September, and in the following month the orders of the Government of India were received to occupy land and erect the necessary shelter both in British and Native territory, and to commence work on the British Branches in anticipation of the sanction of the Secretary of State to the project as now completed. The Survey Division was consequently abolished, and two out of the four divisions into which the Branch lines were divided for construction purposes were constituted from the 1st December; the two divisions formerly sanctioned, and in which work was in progress, comprising only the main line from the heads to the bifurcation of British and Native States Branches.

297. The draft agreement with the Native States had been submitted to the Government of India, in the Civil Department, previous to September 1872.

## 1st Division.

298. Comprises the first 11 miles of the main line with collateral works.

299. *Channel Excavation.*—

	<i>Cubic feet.</i>
Total quantity of excavation ...	351,558,722
Excavated during the year ...	44,624,852
Total excavation to close of year ...	127,808,713

On the 11th mile a very small portion, and on the 10th about one-eighth, remained to complete. The year's work shows a decrease from that in the previous year of 11,079,891 cubic feet, due to the greater number of the laborers who flocked up from the famine stricken districts in 1871 having returned to

## IRRIGATION.

SIRHIND CANAL.  
1st Division.

their homes, but mainly to the excavation over a large portion of the Division having reached the spring level, so that drainage is necessary to carry it deeper. Pumps were tried in a few places, but it was soon evident that this was not an economical mode of working. Drainage cuts to the river have therefore been resorted to, which promises to overcome this, one of the main difficulties of the work, very successfully.

300. Of the above total excavation, 4,259,521 cubic feet were executed by prisoners.

301. The experiments for carrying out the spoil by engine lifts, worked by stationary engines, were continued, and gave more satisfactory results.

302. Towards the close of the year the inclines for working the deep excavation near the head by locomotives and wagons were in hand, and as the completion of the railway now admits of conveying the engines and rails to the spot at a reasonable cost, this mode of working will be on trial ere long.

303. *Excavation, diversion, and drainage cuts.*—Excluding the cuts to unwater the channel excavation, which are temporary only, the state of this portion of the work was as follows :—

	Cubic feet.
Total to be excavated ... ..	105,619,698
Excavated during the year ... ..	3,448,009
Do. up to close of year ... ..	15,559,848

304. The cut to divert the Rúpar nallah was substantially complete, and ready to receive the floods of the ensuing rainy season. The other nallahs cannot be diverted until the masonry passages for them across the canal line are ready to receive the floods, so that the work on them need not at present be pushed on.

305. The aggregate quantity of excavation in *all* channels during the year in this Division amounted to 50,035,761 feet.

306. *Prison labor.*—At the beginning of the year there was shelter for 500 prisoners only ; by the close accommodation for 1500 more was partially complete, and by the commencement of the rainy season was expected to be ready for the occupation of the additional number.

307. *Masonry works.*—The small portions of the shelter for establishment left unfinished at the close of the previous year were completed.

## IRRIGATION.

SIRHIND CANAL.  
1st Division.

308. The quantities of materials collected for the large works were as follows :—

	During the year.	Up to close of year.
	<i>Cubic feet.</i>	<i>Cubic feet.</i>
Boulders ... ..	122,782	360,107
Block kankar, quarried ... ..	458,648	1,181,185
Of this dressed ... ..	100,572	255,734
Lime material—		
Kankar ... ..	255,725	650,408
Lime-stone ... ..	76,205	240,211

309. An exhaustive examination of the Districts near the canal was carried out with reference chiefly to stone and lime for the masonry works.

310. The stratum of block kankar, on the high ground at Patharharf, has proved to be only in part suited for building purposes, but produces a first rate hydraulic lime, and will in all probability yield sufficient of the latter to supply all the large works. Stone of excellent quality, and abundant, has been found in the low hills about 15 miles above Rúpar.

311. *Canal Railway.*—The line was completed, and the first locomotive steamed into Rúpar in the month of March. The branch to the block kankar quarries was partially laid by the close of the year, and would, it was expected, be completed before the ensuing rainy season.

2nd Division.

312. Comprises the next  $26\frac{1}{2}$  miles of the main canal, with the Chamkour Escape,  $3\frac{1}{2}$  miles in length.

313. *Channel excavation—*

	<i>Cubic feet.</i>
Total to be excavated ... ..	514,812,701
Excavated during year... ..	151,712,116
Do. up to close of year... ..	458,970,793

Of the  $26\frac{1}{2}$  miles,  $19\frac{1}{2}$  miles are complete, the remaining seven being in a more or less forward state, and will probably be finished before the close of the current year.

314. The progress on the Chamkour Escape was as follows :—

	<i>Cubic feet.</i>
Total excavation ... ..	18,789,000
Excavated during the year ... ..	6,621,502
Ditto up to close of year ... ..	14,115,359

All except the first mile is completed.

315. The aggregate quantity of excavation during the year was thus—161,332,618 cubic feet, less by 93,607,636 cubic feet than in the previous year, which, however, was an exceptional one, owing to the large influx of workmen from the famine stricken districts, and the greater length of channel over which the work was spread.

IRRIGATION.  
SIRHIND CANAL.  
2nd Division.

316. *Masonry Works*.—The collection of materials for these, except in the item of bricks, of which a small quantity will be required, was suspended, pending the completion of the railway, by which the mass of the building material will be brought from the upper district for the works in this Division :—

	During the year.	Up to close of year.
	Number.	Number.
Bricks turned out ... ..	285,400	1,589,628
	Cubic feet.	Cubic feet.
Kankar for lime ... ..	189,452	198,718

317. *Canal Railway* was completed, as mentioned above, by the close of the year.

318. In the original project masonry syphons or inlets were provided for the disposal of the drainage water from all the sandy ravines which cross the canal line before its entry into the high land bordering the valley of the Satlaj. The experiment of embanking these ravines across, and ponding up the drainage water, has now been on trial for the last two years, and the result is to show clearly that only one or two syphons will be required, the ponding up in most cases being quite safe.

319. This as well as the next Division was formed, as mentioned above, on the abolition of the Survey Division, in December 1872. 3rd Division.

320. It comprises the portion of the British Branches from the bifurcation of the Pattiálah Branches to the Branch head of the Bhattindá and Ubohar Branches, with a portion of the latter.

321. The work of the year consisted in selecting and laying down the canal lines, occupation of land, and erecting as far as possible the necessary temporary shelter for the establishment.

322. Comprises portions of the Pattiálah Branches, in the neighbourhood of the chief towns of Pattiálah and Nabha, together with the lining out of the Main Branch Canal up to the bifurcation on the main line. 6th Division.

323. All the Branches included in the charge, viz., the main feeder lines, Ghaggar and Choá Branches, and Pattiálah Navigation Channel, were lined out by the close of the year.

## IRRIGATION.

SIRHIND CANAL.  
6th Division.

324. Temporary shelter was in progress, and many of the buildings were expected to be completed before the advent of the rains.

325. Brick burning and collection of lime material was also in progress.

326. In the above two Divisions the progress during the year in surveys, &c., was as follows :—

Levels	...	...	...	...	477 miles.
Area surveyed	...	...	...	...	209 square miles.
Area over which operations extended	...	...	...	...	1,910 " "

INVESTIGATIONS FOR  
NEW PROJECTS.

## Swát River Project.

327. A brief notice of this project was given in last year's report. The submission of the detailed design and estimate has been delayed by the removal of two out of the three Officers employed on it : one from failing eyesight at the commencement of the hot weather ; the other at the commencement of the field season from ill health, which terminated in his death last February.

328. Some surveys required for the completion of the design, with measurements of the discharges of channels, were carried out during the year, and the final designs and estimates were in progress at the close. The complete scheme will, it is expected, be ready for submission to Government by the close of the hot season.

Special Survey Division  
Lower Bári Doáb.

329. The hot season of 1872 was occupied in completing the mapping of field work previously done in connection with the projects for irrigation in the lower part of the Bári Doáb, and in the preparation of designs and estimates for opening up old channels from the Satlaj as Inundation Canals, alluded to in last year's report. Some further information, however, was required with reference to the supply heads from the river before an opinion could be found on the scheme.

330. The opinion of the Revenue Officers on the large project for irrigation from the Satlaj, described in last year's report, was called for by the Government of India in August, and submitted in the following February.

## Rechná Doáb Irrigation.

331. As the survey and levelling work in the Bári Doáb was sufficiently complete to form general conclusions on, the establishment was transferred at the commencement of the cold weather to the Rechná Doáb, to collect information with reference to irrigation long since proposed from the river Chináb.

## IRRIGATION.

INVESTIGATIONS FOR  
NEW PROJECTS.  
Rechná Doáb Irriga-  
tion.

332. Cross sections of the country between the Chináb and Ráví, and a careful examination of the river Chináb from the Káshmir boundary downwards, were carried out during the year, the results of which will be reported on during the current year.

333. The aggregate work done was as follows :—

Levels	...	...	...	...	...	2,418 miles.
Surveys	...	...	...	...	...	605 „

Extending over an area of about 7,500 square miles.

334. The possibility of irrigating this tract by permanent works, with a fair prospect of a remunerative return, was one of the objects of the investigation, as well as the alternative, which, of course, would not be so satisfactory in its results, of Inundation Canals.

335. Levels, aggregating 55 miles, were also taken along the course of an old Inundation Canal near Uch, in the Jhang District, on the right bank of the Jhelam and Chináb, with the view of ascertaining the feasibility of re-opening it for irrigation.

Uch Canal.

336. A project for carrying an irrigation channel from the Ráví to the station of Montgomery was also under investigation during the latter part of the year, and will be reported on shortly.

Canal to Montgom-  
ery.

337. The revised project for improving and extending the irrigation in the Derah Ghází Khán District, referred to in last year's report, was submitted by the Superintending Engineer at the end of August. Some further information was called for, which has been supplied, and the scheme is now complete; but its submission for the orders of Government is deferred until questions regarding the mode and amount of water assessment are decided, which will admit of calculating the probable returns on the outlay.

Deráját Circle.  
Special Survey Di-  
vision.

338. The total of this estimate amounts to Rs. 33,48,105, of which ~~Rs.~~ 8,55,685 would be expended on improvement of the existing inundation canals, the remainder on new works.

339. A new line, 138 miles in length, is projected with the view of extending irrigation farther to the westward, and nearer to the Suleimán hills than is possible with the existing canals, as well as to give a supply of water throughout the year to a certain proportion of the area commanded. Ordinary inundation canals can only supply in the summer season, as a rule, and in rare instances during the first two or three months of the winter season, owing to the necessity of keeping the level of their beds at a little below the winter level of the river, to prevent silting up during the floods.

## IRRIGATION.

INVESTIGATIONS FOR  
NEW PROJECTS.Derajat Circle.  
Special Survey Division.

340. In the channel now projected, the bed will be carried sufficiently low to admit a supply in the winter season, and when the usual rise of the river takes place, the lower portion of the head sluices will be closed by gates, over which the water can pass into the canal channel, but which will keep out the heavier portion of the river silt in floods.

341. The scheme also provides for the utilization of the existing canals with a few exceptions, and the construction of distributaries.

342. The aggregate full supply of the existing canals is 4,107 cubic feet per second in the summer season. The new project provides for conveyance of 7,200 cubic feet per second in the summer season, and 1,000 cubic feet per second, when the river is at its lowest, in the winter season.

Sindh Sagár Doáb  
Canal.

343. The greater portion of the designs and estimates for a canal from the left bank of the Indus, opposite Kálábágh, where the river debouches from the Salt Range, were drawn up in the hot season of the year under review. The project completed, as far as can be with the data at hand, will shortly be ready for submission.

Hill Torrent Scheme.

344. An experimental design for utilizing more economically than at present the waters of one of the hill torrents from the Suleimán Range in the Derah Ghází Khán District, together with an estimate, was elaborated during the year, and will be submitted during the current year.

Bannú irrigation.

345. Irrigation has been carried on more or less extensively for many centuries from the rivers which intersect this valley. As usual with all the old systems of irrigation in Upper India the waste of water is great, and with the view of devising measures for economising the existing supply, as well as extending the irrigation to tracts hitherto without it, and therefore unculturable, an examination of the localities was made last cold season, and the necessary levels and surveys carried out. These were still in progress at the close of the year. Enough data have been collected for a preliminary report. There are difficulties here which may render it unadvisable, if not impracticable, to interfere with the existing system; rights to shares of the water-supply having grown up by long usage apparently as valid as those in the land.

Derah Ismail Khán  
irrigation.

346. An examination of this District, with levels and surveys, was carried out during the cold season, chiefly with the view of ascertaining whether the supply of water from the two hill streams in this District, which carry a perennial supply, could be utilized better than at present.



## IRRIGATION.

347. The whole District, with the exception of a small strip along the Indus, is too elevated to be reached by the water of that river.

INVESTIGATIONS FOR  
NEW PROJECTS.  
Derah Ismail Khán  
irrigation.

348. Similar difficulties to those in Bannú present themselves here in the rights to shares of the available water-supply. The District of Tánk claims the lion's share of the water in both streams, the Zám and the Gúmal, when the supply is low. Preliminary report on this is under preparation.

349. In both this and the Bannú valley the field work was slow, owing to the necessity for armed escorts, and always when near the border encamping at night in one of the outposts.

350. A brief account of these canals was given in last year's report.

Mozuffergarh Canals.

351. Cross-sections, at five miles apart, of the tract affected, lying between the Chináb and Indus rivers, were taken during the cold season, as well as the levels of the principal canals. The results will be embodied in a report now under preparation.

352. The operations in this Division during the year thus extended from Bannú to the junction of the Indus and Chináb. The surveys and levels were carried on over an area of 7,200 miles, and the aggregate lengths were, of—

Levels (cross sections)...	...	...	1,632 miles.
Surveys and levels	...	...	2,709 „

353. Allusion was made in the previous year's report to the possibility of drawing a permanent supply of water from the Jhelam for the irrigation of this District, by damming the river close to termination of the low range of hills on the left bank. The localities were examined last cold season, and it was found that no material suitable for such a work is available within a reasonable distance above the town of Jelálpúr, some 20 miles north of Pind Dádan Khán. Stone is procurable here in the hills about six miles from the river. A permanent weir erected at this point would admit of carrying irrigation over the whole tract to the south-ward lying between the Jhelam and Chináb rivers.

Shahpúr Canals.

354. A revised Act to regulate irrigation, navigation, and drainage in Northern India, (No. VIII. of 1873) was passed by the Legislature on the 11th February 1873.

Canal and Drainage  
Act.

## PART IV.—RAILWAYS.

## Guaranteed.

## GUARANTEED.

## SINDH, PUNJAB AND DEHLI RAILWAY.

## Engineering.

355. The commencement of the year 1872-73 found the Sindh, Punjáb and Dehli Railway still in a broken condition, and through traffic interrupted by the Biás break. Very strenuous endeavours were made to overcome this ; and on the 15th May the opening of a temporary wooden bridge over this break re-established through train communication with Calcutta. It was confidently hoped that this would have been maintained throughout the monsoon season ; but the destruction of the temporary causeway over the Gaggar in the end of June, and the subsequent failure of the Satlaj bridge early in July, frustrated this, and left the line again broken and disjointed. The failure of the Satlaj following so soon after that of the Biás shook public confidence in the construction of the bridges over the Punjáb Rivers, and showed that some means must be adopted to protect the piers from the deadly scour to which they were subjected when the rivers rose in flood. The Chief Engineer recommended a liberal use of rubble or boulder stone thrown loose round the base of the piers, and a stone facing or pitching for all bunds exposed to the action of the current. The immediate effect of these measures was most satisfactory, and the works received no further damage.

## Failure of Satlaj Bridge.

## Deputation of Mr. Bradford Leslie, C.E.

356. At the close of the rains the Board of Directors and the Government of India deemed it advisable that Mr. Bradford Leslie, C. E., who was visiting India on professional business, should confer with Mr. Harrison on the most suitable remedial measures to ensure the stability of the large bridges. With these Engineers the Government of India recommended two of the most experienced hydraulic Engineers \* to be associated. The result of Mr. Bradford Leslie's report was to the effect that Mr. Harrison's proposals were most judicious and might safely be accepted, as being the best solution of a very difficult problem, and promising to be a complete success.

## Delay in reconstructing the Satlaj Bridge.

357. The delay in the receipt of the iron-work from England has retarded the reconstruction of the Satlaj bridge, and unforeseen difficulties have likewise acted prejudicially on the work at the Rámídf and Gaggar Rivers, of which, however, the public has not been sensible, as unbroken communication has been maintained by temporary diversions. The extra waterway which recent floods have shown to be necessary, as well as the additions and alterations to existing works, has progressed satisfactorily.

\* Colonel Randall, R. E., and Colonel Crofton, R. E., were the Officers selected.

*Locomotive Department.*GUARANTEED.

358. Considerable improvements have been effected in the construction of carriages in which all classes of travellers have participated, and four 1st class and four 2nd class carriages specially fitted for the through service with Calcutta have been placed on the line.

Through carriages.

359. Coal was introduced on the line for the first time between Ghazíábád and Phillour in October 1872. The consumption of the passenger engines has been about 31 lbs. per mile. On the whole the change has not proved economical; for, as wood-fuel is still in use, many of the engines cannot be adapted for the exclusive use of coal.

Introduction of coal.

*Traffic Departments.*

360. Notwithstanding the breaks which interfere so detrimentally with the flow of traffic, the financial results of

Traffic receipts.

the year 1872-73 show a satisfactory increase of ~~Rs~~ 3,54,781, of which ~~Rs~~ 76,116 is due to passengers, and ~~Rs~~ 2,78,665 to goods. The increase to the

<i>Third Class Passengers.</i>			
1872-73	...	...	19,68,479
1871-72	...	...	18,91,605
Increase	...	...	76,874

number of 3rd class passengers seems to point to a growing appreciation of the benefits of railway travelling, but this improvement must be slow.

361. The only item of receipt that shows a decrease is "special trains;" but the large realization under this head of 1871-72 was due to the Camp of Exercise at Dehli and the movement of troops consequent on the Kúká outbreak, and so must be regarded as abnormal.

362. The items of merchandize in which traffic has been brisk, and which have principally conduced to swell the receipts, are edible grains, hides, iron, salt, seeds, sugar, fuel and State railway materials.

363. The daily train service in this Province has been as follows :—

Train service.

*Multán-Lahore Section.*

One mixed train each way, consisting of 35 vehicles, timed to run during the fair weather months at 20 miles per hour, exclusive of stoppages.

*Lahore-Ghazíábád Section.*

One mail train each way, of 23 vehicles, timed to run 27 miles per hour.

One passenger train each way, of 30 vehicles, running 22 miles per hour.

One goods train.

One up and down local train between Lahore and Amritsar.

## GUARANTEED.

## Breaks on the line.

364. The failure of the Satlaj bridge on the 9th July 1872, and the constantly recurring breaks on the Gaggar, greatly added to the work of the Traffic Department.

365. Contrary to the usual custom of Railways similarly situated, through booking was not stopped, an extra charge only being added for carriage over the break. The conveyance of passengers and their baggage was undertaken by a contractor, but the Company itself arranged for the carriage of goods and merchandize without the intervention of a third party.

## Collisions.

366. The year under review has been very productive in collisions, unhappily attended with some loss of life.

367. On the 18th August 1872, an engine pushing a train of ballast wagons over-ran them, killing a European fireman and a cúlí, and greatly damaging the stock.

368. On the 12th December two stone carrying trains were, from a failure in the telegraph, permitted to run in opposite directions between *Barará* and *Jagádhri*. Each Driver knew the chance of meeting the other train, and although proceeding cautiously, they managed to bring their trains into collision, owing to the view a head being obscured by a fog.

369. On the 15th of the same month the up mail ran into a dead engine left on the line between *Meerut* and *Kattowli*.

370. A Platelayer in the service of the Company jumped and sustained injuries resulting in his death.

371. On the 11th March 1873, an engine on the lower section of the *Mulán* line ran into a train of loaded fuel trucks, damaging the stock, but without loss to life or limb.

372. On the 3rd March 1873, the up mail ran into a disabled stone train standing on the line near the Station of *Sirhind*.

## Railway Commission.

373. During the past cold season, a commission, consisting of the gentlemen named in the margin,\* assembled by order of the Punjáb Government to enquire into the best way of rendering the Railway popular with the natives. The result of this Committee's deliberations has not been made known to the Railway Authorities.

Colonel Hall, Deputy Commissioner.  
Mr. Smyth B. C. S., Ditto.  
Mr. Halsey, Bank of Bengal.

## Reduction of working expenses.

374. In last year's report it was stated that the Government of India had ordered reductions in the Establishment in all Departments of the Railway.

375. These reductions, and a close scrutiny of expenditure by the Heads of Department, has resulted in a diminution of the working expenses by Rs 5,81,982, which must be considered a most satisfactory result.

## GUARANTEED.

## General remarks.

376. The management of the combined undertakings now forming the Sindh, Punjáb, and Dehli Railway has been, for the greater part of the year, in the hands of Mr. J. Harrison, formerly Chief Engineer of the line, who succeeded Major-General Abbott in May 1872, and in October 1872 Mr. Newnham took up the duties of Deputy Agent in Sindh from Captain Wood. These have been the only changes amongst the higher administrative Officers of the Company.

377. The Heads of the several Departments have remained as heretofore, with the exception of Mr. C. Stone, who assumed the Office of Chief

*Chief Engineer*—Mr. C. Stone.  
*Locomotive Supdt.*—Mr. R. Bocquet.  
*Traffic Manager*—Mr. D. Ross.  
*Auditor*—Mr. G. Smith.

Engineer on Mr. Harrison taking up the duties of Agent. Notwithstanding the recurrence of the breaks, the financial aspect of the line has somewhat improved. Both goods and coaching traffic receipts show advancement, whilst the diminution of working expenses tends to augment the net profits to Rs 7,26,884.

378. In a country where the elements of a brisk traffic do not exist, expansion of trade is of slow growth, and it must be many years ere the Sindh, Punjáb and Dehli Railway will repay the guaranteed interest on its capital, but the result of the past year's management and the economy now enforced in its several Departments are already producing fruit.

379. The proposals for the completion of the "missing link," and the hopes of improvements in the port of Karáchi, seem to hold out a brighter future than the undertaking has yet experienced.

## State Railways.

## PUNJAB NORTHERN (STATE) RAILWAY.

## STATE.

380. Expenditure under this head ceased some time ago under the terms of Government of India No. 398 S. R. dated 23rd March 1872.

Preliminary Expenses.

381. Nearly all land required has been taken possession of, including that connected with the revised project for the Rávi training works. Payments, however, still continue to be made on this account, owing to their somewhat complicated character of settlement.

Land.

STATE.	CONSTRUCTION OF LINE.
Earth-work.	382. Work under this head is sub-divided as follows :— Earth-work for temporary purposes.
	Do. in embankments.
	Do. in cuttings.
	Do. in level crossings.
	Do. in road diversions.
	In the two principal of these, in which the largest quantities exist, namely, " <i>embankments and cuttings</i> ," the work approaches completion. The parts remaining unfinished being those in the approach embankments to the three main bridges. The heavy work in the Kharián pass summit cutting was practically finished at the end of 1872.
	383. Under the head " <i>temporary purposes</i> ," the work consists principally in the siding for the Gujranwála Ballast Depôt at the Badámí Bágh, Lahore, and in the renewal of the Chináb boat bridge approaches. The former work has long been finished. Of the total quantity to be executed, 70½ per cent. has been done to date.
	384. As there is at present no occasion to push on the " <i>earth-work in level crossings</i> ," the per-centage executed of the total estimated quantity is about 50 per cent. only.
	385. In earth-work in " <i>road diversions</i> ," 26¾ per cent. has been done to date. Progress under this head is at present of no importance.
	386. Taking the aggregate result of operations in earth-work, there has been executed to date 33,788,872 cubic feet, or 34½ per cent. of a total estimated quantity of 45,603,124 cubic feet.
Metalling.	387. Work under this head is in metalling of road diversions and at flush gaps—44¾ per cent. has been executed to date.
	388. <i>Main Bridges and Culverts</i> .—All the permanent bridging between Lahore and Jhelam, with the exception of that at the crossings of the three main rivers, is included under this head.
Bridge Work.	389. <i>Ordinary and special flush gaps</i> .—The ordinary gaps are completed, including the lengthening (to a minimum of 200 feet) of the horizontal bottom between the opposing gradients of each. The completion of the work in the majority of the special gaps awaits the arrival of the girders.
	Palkú Nallah Bridge. 390. <i>Palkú Nallah</i> (permanent) <i>Bridge</i> at mile 62 (nine spans of 12 metres, or 13½ metres from centre-to-centre of piers). Of the eight piers, the foundations of three are sunk, and those of the remaining five have only to go down an average of four feet each. The basement of the south abutment

## STATE.

is finished. The eight wells of north abutment are being sunk the third lift ; progress with them has been delayed, owing to coming upon sunken timber in the bed of the nallah. The masonry, however, will be ready before girders arrive.

Palkú Nallah Bridge.

391. *Bhimbar Bridge* at mile 74 (20 openings of 12 metres clear span) nearly ready for girders. There being only some work in the superstructure of abutments remaining to be executed. This is in hand.

Bhimbar Bridge.

392. Of the whole of the remaining minor bridges and culverts, the completion of the bridge of three 26 feet spans near Gujrat leaves only two unfinished, namely, the bridge of three 40 feet spans across the back-channel of the Rávi at mile 2, and the two span girder bridge at mile 103 near Jhelam. The former is not yet commenced, although bricks and other materials are being brought on to the site ; the masonry of the latter is up to girder level, and a temporary road has been laid across it.

Minor Bridges and Culverts.

## LARGE RIVER BRIDGES.

393. *Rávi* (33 spans of 90 feet clear). The general questions affecting the design of this, as well as the other two bridges, were sufficiently determined at the beginning of the year to permit of the submission of complete estimates for them, the only element of uncertainty in which is the value of girders. In these, the total cost of the Rávi bridge was given as Rs 19,66,176. In design the Rávi bridge consists of 32 piers, each founded on three 12 feet and 6 inches diameter wells, sunk to a minimum depth of 70 feet below low-water level, and of abutments with faces founded on three wells of the same diameter and depth, and with parallel retaining walls founded on 10 feet walls. The abutments are further protected by flooring, extending out to the second pier from each abutment, pitching of slopes, &c. The girders are adapted to carry both road and railway, thus necessitating specially designed approaches. The cart-road is carried on the same level as the railway, and there is a foot-path under this level between the girders, with a minimum width of six feet and nine inches at the centre of each span. The upper roadway on which the railway and cart traffic is carried has a width of  $13\frac{1}{2}$  feet between the hand-rails, and is provided with a footway on either side of the line of rails.

Rávi Bridge.

394. Twelve piers and one abutment were in hand at the commencement of the year ; the whole 32 piers and both abutments with their retaining walls are now in progress, and the wells of all the piers and the face of one abutment (the right or north) are sunk to the prescribed depth. The only

## STATE.

## Rávi Bridge.

wells that have not reached the required depth, are, one in pier No. 18, and those in the face of the left or south abutment, and the retaining walls of both abutments; they are, however, very far advanced. The total number of wells in hand was 101, 12 feet and 6 inches diameter (namely, the whole of those in piers and abutments, with the exception of the removed centre well of pier No. 18); and 24 10 feet diameter (in abutment retaining walls). Of the 12 feet and 6 inches diameter wells, 54 were fully sunk and concreted, 20 fully sunk only; the remainder, 27, with one or two exceptions, being nearly so. Of the 12 10 feet diameter wells in the north or right abutment, two were fully sunk, and the whole of the others well advanced; of those in the other abutment, none were sunk below 20 feet beneath low-water level. The piers have all been protected with concrete blocks as deep as excavations could be made; additional blocks can be added as those now in sink, but not before.

395. The only exception to the general success of well-sinking has been in the case of the centre (12 feet and 6 inches diameter) well of pier No. 18, which in its descent, at a depth of 12 feet below the lowest water level, came upon some *shisham* trees, supposed to be the cargo of a wrecked boat. These obstacles have necessitated the removal of the centre well; but the up and down stream wells are sunk to full depth, and are safe against the floods of this year.

396. The quantities of work executed up to date in this bridge are as quoted below. Each triplet of wells is being braced with two bands of iron belting:—

	Cubic feet.
Earth-work in well-sinking ... ..	851,000
Brick-work in well and superstructure ... ..	750,000
Concrete in hearting of wells ... ..	96,600
	No.
Well-curbs prepared, 12 feet and 6 inches diameter ... ..	100
Well-curbs prepared, 10 feet diameter ... ..	24

397. The basements of 25 piers are nearly completed, and similar progress has been made with the superstructure of 24 of that number. It has been reported to Government that, if the girders of this bridge can be delivered before the 1st October next, the bridge could be made ready for traffic by the 1st June 1874, and this, I believe, can be done. The season's work does great credit to Mr. Mallet, the Superintendent, and to his Staff.

## Chínáb Bridge.

398. *Chínáb Bridge* (64 spans of 133 feet and four inches clear). The cost of this work has been estimated at Rs-41,93,973. It is designed to consist of 63 piers of three 12 feet and 6 inches diameter wells, each sunk to a minimum depth of



## STATE.

## Chínáb Bridge.

70 feet below low-water level ; the faces of the two abutments being founded on three 12 feet and 6 inches diameter wells, each sunk to a similar depth ; their parallel retaining walls being, as in the case of the Rávi, founded on 10 feet diameter wells. The girders are designed to carry both road and railway on the same level, without any provision for foot-traffic below, as in the cases of the Rávi and Jhelam.

399. The railway is carried in the centre of the space of 3·880 metres between the curb plates of the girders, thus leaving a footway of 1·393 metres on either side. As this arrangement would not permit the ordinary road traffic carts to pass each other, it is proposed to construct four of the spans of greater width to provide passing places.

400. At the commencement of the year, of the total of 63 piers and two abutments, 13 piers and one abutment (the north) were in progress. The present working season closes with 138 of the total of 195 wells in piers and abutments either finished or nearly so, leaving only 57 to be executed next year. The superstructure of 13 piers has also in part been completed, that of three more is in progress, and three basements are ready for the commencement of superstructure. Thus one quarter of the bridge is ready for its girders, and more than two-thirds of the foundations are in. If the girders are received by December next, the bridge can be made ready for traffic early in 1876.

401. Boulders and concrete blocks are being placed round the piers as the basements are completed ; the quantities varying from 3000 to 6000 cubic feet, according to the more or less exposed position of the pier under treatment, and the depth to which excavations can be made.

402. Nineteen 10 feet wells in the abutments are either very far advanced or completely finished and concreted.

403. The quantities of work executed to date are as given below. The collection and manufacture of materials proceed actively on a corresponding scale. The work done at this bridge during the year reflects the greatest credit on Mr. Lambert and his Staff. It must have required the most unceasing attention, energy and skill to accomplish it. I do not recollect having seen so much work done under one man's supervision before, and I can certify that what is done is of the best kind. I consider that such a season's work calls for some marked acknowledgment on the part of Government :—

	<i>Cubic feet.</i>
Earth-work in well-sinking ... ..	866,487
Brick-work in wells, foundations and super- structures ... ..	919,007
Concrete in hearting wells, &c. ... ..	271,976
	<i>No.</i>
Well-curbs prepared, 12 feet and 6 inches diameter ... ..	114
Well-curbs prepared, 10 feet diameter ...	24

## STATE.

## Jhelam Bridge.

404. *Jhelam Bridge* (50 spans of 85 feet clear). The cost of this work has been estimated at ~~Rs~~ 14,78,077. The 49 piers were, each originally designed to be founded on a central well of 12 feet and 6 inches, and two flanking wells of 10 feet diameter ; but, owing to the stock of 10 feet well-curbs having run short, 12 feet and 6 inches well-curbs were in some instances substituted to prevent delay in the progress of the work. The south abutment of the Jhelam bridge is founded on three wells of 12 feet and 6 inches diameter, with parallel retaining walls founded on 10 feet diameter wells. The north abutment face is founded in a similar way, but the retaining walls are based on the shingle bank at a depth of three feet and six inches.

405. The girders are designed for both road and railway, in a simliar manner to those of the Rávi; the railway and ordinary traffic being carried above, with a foot-passenger road below. The work in hand at the commencement of the year was that in both abutments and 10 piers ; it now consists of that in the abutments and 21 piers (not including pier No. 40 destroyed). The flanking wells of the north abutment are sunk  $27\frac{1}{2}$  feet below ground level, and have penetrated four feet into the boulder bed ; the middle well has to be sunk three feet more to reach the same depth. The three face wells of the south abutment have been some time completed, and the 10 feet wells in its retaining walls are satisfactorily progressing. Sixteen of the 21 piers have been sunk the prescribed depth ; and at the time of report, four of the remaining five piers were shortly expected to reach the same stage of advancement.

406. The work that has been executed to date is as noted below. The supply of materials continues ample :—

	Cubic feet.
Earth-work in foundations and well-sinking	272,467
Brick-work in wells ... ..	162,639
Concrete in pitching ... ..	4,394
	No.
Wrought-iron well-curbs prepared, 12 feet and 6 inches diameter ... ..	35
Wrought-iron well-curbs prepared, 10 feet diameter ... ..	39

407. The progress made with the well-sinking of this bridge has been slow compared with that done at either the Rávi or Jhelam, but there seems to be great difficulty and uncertainty in sinking through the boulder bed.

408. The heavy floods of June and July 1872, in addition to very considerably damaging the training works, as will be noticed elsewhere, overturned and entirely destroyed pier No. 40 then in progress, and carried away quantities of plant and building and permanent-way materials.

## STATE.

409. The borings necessary to enable the condition of the site of pier No. 40 to be ascertained have occupied so much time, that the restoration of the pier has not yet been undertaken. Jhelam Bridge.

410. During the year a continuous series of borings across the bed of the river on the site of the bridge was undertaken with the object of finally and accurately determining the thickness of the shingle stratum ; they were not completed at the time of the commencement of the floods, and must now await resumption next year.

## TRAINING WORKS.

411. In July 1872 these works sustained damage from floods, but not of a serious character, in so far as the actual destruction of works was concerned. A tree-spur at the head of the back-channel was damaged, and another on the south bank of the river at the up-stream side of the temporary bridge gave way, carrying with it part of the temporary bridge. Rávi Training Works.

412. In May 1872, detailed proposals were laid before Government in connection with the orders conveyed by Government of India's No. 2096 R dated 20th October 1871, and instructions were received in the following July. It was then definitely determined that the sluices at Mahmúd Búti at the head of the back-channel should be connected with the railway formation by a continuous embankment, such embankment being strengthened at intervals of 5 or 600 feet by groines or tree-spurs, each of about 150 feet in length. During the latter portion of the year these works were taken in hand, and are now making satisfactory progress.

413. These works have been long completed, with the exception of part of the extension of the Harrípúr bund to the south abutment of the Chenáb bridge, a work designed to intercept the over-fall of the main stream of the Chenáb into the Palkú nallah above Wazírábád. The quantities of work executed to date are as quoted below :—

Chenáb Training  
Works.

Tree-spurs ... ..	55,997 lineal feet.
Piling ... ..	1,559 " "
Sand bags in place ... ..	97,493 superficial feet.
Willow planting ... ..	490 acres.

414. In July 1872 these works were seriously damaged by an extraordinary flood ; the Jábá spur on the left bank, some distance above the bridge, being entirely carried away, and the change in the direction of the main current resulted in the loss of one pier (No. 40) of the bridge then in progress. On the subsidence of the season's floods, a new survey of the

Jhelam Training  
Works.

## STATE.

Jhelam Training  
Works.

river bed was undertaken to aid in the consideration of the question of the treatment of its training works ; pending the result of present deliberations on this subject, no further additions have been made to the works. The quantities of work executed to date are noted below :—

Tree-spur	..	..	..	..	5,540 lineal feet.
Willow planting	..	..	..	..	4 acres.
Grassing	..	..	..	..	54,325 superficial feet.
Munj	..	..	..	..	1,129 maunds.
Boulders	..	..	..	..	41,811 cubic feet.
Fascines	..	..	..	..	28,490 superficial feet.

## TEMPORARY BRIDGES.

Rávi Temporary  
Bridge.

415. *Rávi Temporary Bridge*—(147 spans, namely, 110 of 14 feet, 4 of 16 feet and 33 of 18 feet). On the 9th of July 1872, this structure lost 35 spans in the flood, which at the same time did so much damage to the training works. Nearly the whole of the materials of these spans were, however, recovered, and the bridge was restored in the following December, and has been in uninterrupted use ever since for the traffic between Lahore and Sháhderá.

Palkú Temporary  
Bridge.

416. *Palkú Temporary Bridge*—(20 18 feet spans). This work, destroyed by the floods of 1871, was restored.

417. The only other important temporary bridge is that of 65 spans (900 feet in length) across the right bank channel of the Jhelam. This, however, is removed during the flood season, as are also the temporary bridges across Channels Nos. II., III. and IV. of the Chenáb River.

## LEVEL CROSSINGS.

## Level Crossings.

418. There is at present no necessity for the erection of the gates for these crossings, and the only ones at present completed and in use are the two across the Trunk (Amritsar) Road at the Lahore terminus of the Railway. The progress of the earth-work at these crossings is shown under para. 382.

## FENCING.

419. There has only recently been expenditure under this head, and that to a small amount.

## BALLAST AND PERMANENT-WAY.

## Ballast.

420. Out of the total estimated quantity of ballast required, namely, 4,898,040 cubic feet, a quantity of 3,246,222 cubic feet, or  $66\frac{1}{4}$  per cent., has been collected, and of that quantity in turn 919,666 cubic feet has been spread:

## STATE.

## Permanent-way.

421. Of the 60 lbs. per yard material originally delivered for the standard or five feet six inches gauge, only about 200 tons remain in Calcutta, the remainder being distributed between this Railway, and the Sirhind Canal, 60½ miles with the former and 45½ with the latter.

422. The delivery of the metre gauge (40 and 36 lbs. per yard) permanent-way material was, during the earlier portion of the official year, much retarded by the interrupted state of railway communication on the Sindh, Punjáb and Dehli Line, but several arrangements were made to obviate this; and, at the present time there are about 111 miles of this material delivered complete, with all necessary fastenings, namely, 41 miles of 40 lbs. per yard, and 70 miles of 36 lbs. per yard. This material, where not laid in main line or tramways at the bridges, is used for well weighting along with the 60 lbs. material.

423. The quality of the rails of Belgium manufacture has been found so bad, as to render the possibility of their use in the main line doubtful.

424. The main line and sidings on the Rávi Bridge Division are still retained of the standard gauge to enable the service traffic between Lahore and Sháhderá to be carried on by our own engine, and to allow us to continue to have the advantage of the use of Sindh, Punjáb and Dehli, and East Indian Railway Company's rolling stock.

425. At the Chenáb Works 6,200 yards of the main line narrow gauge has been laid for service purposes, as well as 3,500 yards of temporary tramways. In addition to this, there are 6,233 yards of five feet six inches gauge temporary tramways, making a total length of nearly nine miles and three-quarter of line of both gauges.

426. The five feet six inches gauge tramways on the Jhelam Bridge Works have all been converted to the metre gauge.

## SLEEPERS.

427. Practically the whole of the metre gauge sleepers required for the line between Lahore and Jhelam, namely, 196,966, were ready before the 31st December 1872, also 69,092 for the extension from Jhelam to Ráwalpindi, making a total of 266,058 altogether.

## Transverse sleepers.

428. Of these, 27,326 cubic feet are required for the three large bridges and the flush gap crossings on the Gujráwála and Khárán Sub-Divisions. So long as platelaying is not commenced, there is no necessity for occupying the otherwise engaged saw-mills with their manufacture, the more so, as they can be very speedily turned out when required by the ample means available. A quantity of 7,589 cubic feet or 27½ per cent. have been got ready to date.

## Longitudinal sleepers.

STATE.  
Stations.

## STATIONS AND BUILDINGS.

429. *Lahore*.—The orders of Government have not yet been received on the general proposals for the *terminal station at Lahore* submitted by Mr. Grant in February 1872. The new head-quarters offices at Lahore (to accommodate the Chief Engineer, Deputy Controller, Chief Store-keeper, and Superintendent of Works Ravi Section) were commenced in November, and will be ready for occupation in September. Delay has been caused by the unexpected depth to which it became necessary to carry the foundations.

430. *Sháhderá Station*—(Mile 5, two units).—The station building is up to floor level, and materials are collected for the remainder of the building. The Station-Master's and Telegraph Clerk's quarters, and station employés' houses, are similarly advanced. The latrine, pointman's and gate-keeper's huts and ash-pits are not yet commenced. One-fourth of the earth-work is done. The fencing, as elsewhere, has not been commenced.

431. *Moredkí Station*—(Mile 17, one unit).—The station building, Station Master's, Telegraph Clerk's and station employés' houses are built, but the internal fittings of the station building are not yet fixed. The earth-work is completed. The latrine, pointman's and gate-keeper's huts, and fencing, are not yet commenced. The other three stations, as noted below, on the Gujránwála Sub-Division are in exactly the same state :—

					Mile	Unit.
Kámukí	..	..	..	..	29	1
Gujránwála	..	..	..	..	41	3
Gakkar	..	..	..	..	52	1

432. *Wazirábád Station*—(Mile 61, three units).—The booking office, Station Master's and employés' houses are built. The ash-pit, platform wall, water hoist and well and main siding are also completed. The tank is built up to the floor of the cistern.

433. *Gujrát Station*—(Mile 71, one unit).—The booking office, Station Master's and employés' houses are built and the well and ash-pit completed. The tank is at the springing level of arch.

434. *Láláh Musá Station*—(Mile 81, one unit). Booking Office, Station Master's and employés' houses, well, tank and ash-pit completed.

435. *Kharián Station*—(Mile 91, one unit).—Booking Office, Station Master's and employés' houses finished. The reconstruction of the well is in progress. This well is to be 140 feet in depth. The original work having shown signs of failure in the steaning, from an inadequate curb, orders were given for reconstruction.

	STATE.
436. <i>Jhelam Station</i> —( Mile 103, five units ).—The station building and employés' quarters are finished. Goods and engine-sheds remain as before.	Stations.
437. For immediate use built.	Workshops.
438. These are completed, including additions made during the year to the quarters on the Rávi Bridge Division.	Staff Quarters.
439. Work under this head generally awaits materials from England, from which however deliveries are now being made.	Station Machinery.

## ELECTRIC TELEGRAPH.

440. A second wire was laid for this Railway between Lahore and Wazirábád in the earlier part of the year, and a temporary office opened at the latter. This places head-quarters in communication with four stations, namely, *Wazirábád*, *Jhelam*, *Ráwalpindi*, and *Attok*.

## PLANT.

441. Towards the close of the year the heavy deliveries of plant that had been for some time proceeding were completed, and a great part of the articles required from England, and indented for in June 1871 have been received. The only remaining want is that of diving dresses, which are found to rapidly deteriorate under constant use in this extreme climate.

## ROLLING-STOCK.

442. Ten wagons only of the five feet and six inches gauge now remain on this Railway, 50 having been transferred to the Sirhind Canal. Fifty-seven (57) metre gauge wagons have been received, and some of them are in use where the line is of that gauge. The whole of the timber required for the erection of the stock noted below has been received from Calcutta, and arrangements are under consideration for carrying out the work in the shops of the Sindh, Punjab and Dehli Railway Company. The iron work for these vehicles is however not yet to hand.

1st and 2nd Class and Composite coaches	...	8
3rd Class	... ..	20
Horse Boxes	... ..	6
Carriage trucks	... ..	2
Break-vans	... ..	8
Goods stock	... ..	150

443. In Locomotive Stock, four metre gauge engines have been received and erected, three at Sháhderá, and one on the Chinab works. The former are not brought into use, owing to the expediency at present of retaining the five feet and six inches gauge between Lahore and Sháhderá (on which

## STATE.

## Locomotive Stock.

the five feet and six inches gauge engine ( "Gnat" ) continues to work), but the engine at the Chínab has been sometime past working. A detailed report has been submitted on these engines, pointing out certain defects which have been observed in them.

## ESTABLISHMENTS.

Changes in Estab-  
lishment.

444. Considerable changes in both Engineering and Office Establishments have been made during the period under report. In the earlier part of the year the line was divided into five Constructive and three Survey Divisions, the former including the line between Lahore and Jhelam, the latter that of the Ráwalpindi extension, (Jhelam to Ráwalpindi) and Indus Tunnel Division. Under this arrangement the Chief Engineer was also Superintending Engineer of three Divisions, namely, the Ráví Bridge, Gujránwála, and Chínab Bridge Divisions (mile 0 to 71); Mr. Rayne was Superintending Engineer of the Jach District, comprising the Khárián and Jhelam Bridge Divisions; and Mr. James Collet of the Ráwalpindi extension and Indus Tunnel Divisions. In October 1872 proposals were submitted and approved for a reorganization of the staff, by which the Rechná and Jach Districts were abolished. Under the new arrangement the line between Lahore and the south bank of the Jhelam (that is excluding the Jhelam Bridge Division itself) was divided into two sections, each consisting of a bridge and ordinary Division, and placed under the Officers in charge of the Ráví and Chínab Bridges, respectively; those Officers being then appointed Superintendents of Works. This arrangement was originally intended to have been also applied to the Jhelam Bridge Division, but that charge was eventually added to the district of the Superintending Engineer Ráwalpindi District, which then extended from the south bank of the Jhelam to Attok, and comprised the Jhelam Bridge, Bakrála (or two extension survey) and Indus Tunnel Divisions.

445. These changes came into operation on the line between Wazirábád and Attok in November last, but not till April 1873 on the Ráví Section (Lahore to Wazirábád). The new arrangement has effected very considerable economy, by dispensing with one Superintending Engineer (Jach District), and the reduction of the former Gujránwála and Khárián Divisions to Sub-Divisions, the reduction in Engineering Staff being accompanied by corresponding ones in stores and office establishments. The new disposition of work has worked as well as was anticipated.



## STATE.

## Changes in Establishment.

446. There has been a change in Direction during the period under report. Mr. Middleton Rayne, late Superintending Engineer Jach District, Officiated as Chief Engineer from July to October 1872, while Mr. Alexander Grant was on leave.

## SALT BRANCH SURVEYS.

447. These consist of two alternative lines, one leaving Jhelam and passing along the right or north bank of the river, the other diverging from the main line at Lálah Musá Station, and running out to meet a wire tramway now under construction. The estimates for both proposals were reported complete in October last, but Mr. Alexander Grant, on a personal examination of the right bank route, found that its further examination was desirable between the town of Jhelam and Dárialá, a point 12 miles from Pind Dádan Khán, and this necessary additional field-work was accordingly undertaken as soon as an Officer could be spared to attend to it. The required observations have now been completed, and the final estimates will shortly be sent forward by the Superintending Engineer of the Ráwalpindi District.

## BAKRALA DIVISION.

448. The orders of Government were received on this extension of 68 miles in September 1872. Permission was then given for the commencement of the construction of Staff Quarters on the submission of an estimate for them; final orders on the remainder of the work being withheld, pending the revision of the estimates for four of the larger bridges, for those parts of the line where steep gradients and sharp curves existed in the original proposals, and for the proposed deviation from the Trunk Road at Ráwalpindi Station.

Extension to Ráwalpindi.

449. The estimates for Staff Quarters, providing for the utilization during construction of the 3rd class stations for that purpose, are nearly ready. The remaining estimates are also nearly complete.

## INDUS TUNNEL DIVISION.

450. The alternative tunnel and bridge estimates and designs were submitted after the end of the year. These will be submitted to Government in due course. Mr. Geoghegan, the Executive Engineer, by whom these were framed, was obliged to proceed to Europe on furlough in January last; he however left the documents, which do him very great credit, complete for the Superintending Engineer. His successor, Mr. Avern, and an Assistant Engineer, Mr. Shanks, have been,

Indus Tunnel.

## STATE.

## Indus Tunnel.

since Mr. Geoghegan left, principally engaged in an examination of the Trunk Road between Ráwalpindi and Attok with the view of determining its fitness for the extension of the Railway to the Indus. Their work during the cold season consisted of the following :—

- (i), survey, pegging out, and levelling of 54 miles, two furlongs, 32 poles of road between Ráwalpindi Station and the Indus Tunnel shaft ;
- (ii), survey and levelling of six Divisions, aggregating three miles in length ;
- (iii), two hundred cross sections.
- (iv), one hundred and twenty-seven bridges and culverts measured, sketched, and examined ;
- (v), seven road bungalows measured, sketched, and examined ;
- (vi), new water gauges fixed on the bridges crossing minor streams between Ráwalpindi and Attok, and those at the Indus repaired ;
- (vii), nine miles of levelling done off the road between Lawrencepúr and Attok, where numerous narrow bridges occur, which may necessitate a deviation from the line of the Trunk Road.

MAINTENANCE OF THE GRAND TRUNK ROAD, LAHORE TO  
JHELAM.

451. This work (exclusive of the Ráví, Chínab and Jhelam, and other boat bridges), for which funds are supplied by the Punjáb Government, has been carried on by the Railway Officers in addition to their other duties. The expenditure on repairs and maintenance has been Rs. 1,05,673, and in laying down an extra four feet strip of metalling on the cart traffic side of the road (an exclusively Railway charge by the orders of the Punjáb Government) ~~Rs.~~ 49,942, total expenditure ~~Rs.~~ 1,55,615.

## Concluding Remarks.

452. In May 1872 detailed estimates were submitted to Government, and sanctioned, for the line between Lahore and Jhelam. In these the total cost of that section was given as ~~Rs.~~ 1,68,88,295 (an amount of ~~Rs.~~ 7,76,425 being deducted for the recoverable value of 60 lbs. permanent-way material used for loading wells). This sum, added to the estimated cost of the Ráwalpindi extension (~~Rs.~~ 26,77,054), gives the total cost of the 171 miles of Railway between Lahore and Ráwalpindi as ~~Rs.~~ 1,95,65,349.

## INDUS VALLEY (STATE) RAILWAY.

## STATE.

453. At the close of last year the state of the three Districts forming this Railway may be briefly described as follows :—

454. Seventy miles of bank finished ; 10 lākhs of bricks burnt ; six miles of ballast collected ; 19 units of Staff Quarters finished and occupied. Multán District.

455. Eight millions of cubic feet of earth-work in bank thrown up. Upper Sindh District.

456. Survey work drawing to a close. Lower Sindh District.

457. During the current year some changes were made in the distribution of Districts. Distribution of Districts.

458. The Satlaj bridge, with 13 miles of line, and the Indus bridge, with 15 miles of line, were constituted distinct charges, to be placed under Superintendents of Works. About 50 miles of the northern end of the old Upper Sindh District were thrown into the Multán District, and the Upper Sindh was extended to a distance of 70 miles southward into the Lower Sindh District.

459. The new arrangement stands thus, for charges of Superintending Engineers and Superintendents of Works :—

460. *Multán District*.—From Multán to 172nd mile, excluding the Satlaj Bridge, 159 miles.

461. *Satlaj Bridge Division*.—From the 50th to 63rd mile, 13 miles.

462. *Upper Sindh District*.—From the 172nd to 338th mile, excluding the Indus Bridge Division, 151 miles.

463. *Indus Bridge Division*.—From the 270th to 285th mile, 15 miles.

464. *Lower Sindh District*.—From the 338th to 498th mile, 160 miles.

465. These Districts have been sub-divided as follows into works Divisions :—

*Multán District*.—Shujábád Division up to 50th mile, 50 miles.

Independent—Satlaj Bridge, 50th to 63rd mile, 13 miles.

*Multán District*.—Baháwalpúr Division 63rd to 122nd mile, 59 miles.

*Multán District*.—Khanpúr Division, 122nd to 172nd mile, 50 miles.

*Upper Sindh District*.—Rehtí Division, 172nd to 221st mile, 49 miles.

*Upper Sindh District*.—Ghotkí Division, 221st to 270th mile, 49 miles.

Independent—Indus Bridge, 270th to 285th mile, 15 miles.

## STATE.

## Distribution of Districts.

*Upper Sindh District.*—Larkháná Division, 285th to 338th mile, 53 miles.

*Lower Sindh District.*—Mehár Division, 338th to 391st mile, 53 miles.

*Lower Sindh District.*—Schwan Division, 391st to 446th mile, 55 miles.

*Lower Sindh District.*—Kotrí Division, 446th to 498th mile, 54 miles.

## Shujábád Divisions.

466. In this Division the whole of the 50 miles of embankment have been completed ; 22 miles of ballast have been collected, but not all carried to site ; 30 culverts have been built and 10 more commenced, out of 163 required. For the 1·4 lákhs of cubic feet of brick-work on the line remaining to be built, bricks have been burnt for 0·4 lákhs cubic feet. Of the five stations in this Division, the buildings of two are nearly complete, those of two more are in progress, and the fifth, the Multán station, is not commenced.

## Satlaj Bridge Division.

467. Ten miles of bank, out of 13, are complete and three in progress ; one mile of ballast has been collected. Of two culverts required, one has been built, and of 36 lineal metres of larger bridges nothing has been done. For the 1·2 lákhs of cubic feet of brick-work to complete bridges on the line, the bricks for 2500 cubic feet are ready. The single station is nearly complete, and seven houses for Staff Quarters have been built, one of which was lost by erosion of the river.

468. At the Satlaj Bridge four trial wells have been sunk to depths respectively of 95, 92, 55 and 16 feet. A hitherto unsuccessful effort was made to protect the right bank of the river from erosion, and some 900 yards of depth were lost, involving the destruction of the largest block of Staff Quarters in the Adamwáhan colony. In preparation for the bridge, 35 lákhs of bricks have been made, out of 200 lákhs required, and arrangements have been made for a large supply of lime, so that work may be put in hand early next season. Twenty-eight iron well curbs, made up by the Sindh, Punjáb and Dehli Railway Company in their workshops at Karáchi, have been delivered or are in course of transport to site.

## Báháwalpúr Division.

469. The whole of the 59 miles of bank have been completed, and 17 miles of ballast collected, but probably 20 per cent of the latter is of bad quality and unfit for use ; 183 culverts, and 24 lineal metres of flood openings, are required, none of which have been commenced. For the 2·5 lákhs of cubic feet of brick-work contained in these works, all the bricks have been manufactured, and some lákhs of bricks have also been burnt

## STATE.

for ballast. There are five stations in the Division, the buildings of four of which have been nearly completed, and the fifth is about three-quarters done. Of Staff Quarters, two houses are nearly finished, one is in forward state and two are but just commenced.

Báhawalpúr Division.

470. Of the 50 miles of bank in this Division, 36 have been completed, nine are in progress, and five not yet commenced ; no ballast has been prepared. Of the 132 culverts, and 150 lineal metres of flood openings, one culverts only has been built. For the three lákhs of cubic feet of brick-work contained in these works, the bricks for 24,000 cubic feet have been made. The buildings for one of the four stations are nearly complete ; those for the other three are in progress. One Staff quarter house is nearly complete, two are in hand, and two have been pulled down in order to be rebuilt. The whole of the work in this Division, as reported specially to Government, is of very inferior quality.

Khanpúr Division.

471. Of the 49 miles of bank in this Division, 32 have been completed, and 17 are in progress ; no ballast has been prepared. No work has been executed on the 72 culverts and 1128 lineal metres of flood openings. For the six lákhs of cubic feet of brick-work contained in these works, no bricks are ready. Of the four stations, the buildings of one are nearly complete, of three others very recently commenced. Of the Staff Quarters four houses are nearly ready, and two have been recently commenced.

Rahtí Division.

472. Of the 49 miles of bank, 40 are in hand incomplete, and nine are not touched. The height of bank has been increased since the flood observations of 1872 ; no ballast is ready. No work has been done on the 79 culverts and 3654 lineal metres of flood opening required ; and no bricks or other material is ready for the 12·3 lákhs of cubic feet contained in this work. Of the six stations, the buildings of four are nearly complete, and those of two are in a forward condition ; and for Staff Quarters two houses are nearly complete and two others recently commenced.

Ghotkí Division.

473. The above 270 miles of line, reaching to Rohrí, comprise the whole of the line on which work has been done. Below the Indus crossing at Sakkar a mere commencement has been made ; and it is convenient at this point to present the above information in a collected form.

474. On the 270 miles of line between Multán and Sakkar, 187 miles of bank are complete, 69 miles are in progress, and 14 have not yet been touched. Ballast has been collected for 40 miles. Out of the 649 culverts and 4992

## STATE.

## Ghotki Division.

lineal metres of flood openings required, 32 culverts have been built and 10 more in hand. For the 26·5 lákhs of cubic feet of brick-work in the remaining works on the line, bricks have been prepared for 3·2 lákhs cubic feet. For the bridge over the Satlaj river, 35 lákhs of bricks have been made out of 200 lákhs required. Of the buildings for the stations, those of thirteen stations are nearly completed and are inhabited, for eight are in progress and well advanced, for three are recently commenced, and for one not yet touched. This is the Multán station, which must lie over for some little time. Of houses for Staff Quarters, nine have been completed, seven nearly completed, three are in progress and well advanced, and eight have been recently put in hand. For this part of the line 11 miles of rails have been received, and 50 miles of metre gauge sleepers have been prepared.

## Indus Bridge Division.

475. Flood observations were taken during the past season at Bakkar, but a very close examination of the bed was not possible owing to the late date at which operations commenced. Since Christmas surveys of the river's bed have been put in hand, and two trial wells have been sunk opposite new Sakkar, but it was only quite at the close of the year that an Executive Engineer joined, and an organized system of observations could be arranged.

476. The few miles of approach on either side of the river, which, with the crossing from this Division, are necessarily in abeyance until the site of the crossing can be fixed.

477. The 215 miles of line remaining down to Kotri formed the old Lower Sindh District; the surveys of this portion were approaching completion, under Major Bonus R. E., at the end of last year.

478. The field-work was carried into Karáchi, and the plans and estimates were got out and taken up to Simla by Major Bonus in September. Early in November the Government of India issued their instructions, and the four works Divisions were at once defined, but some time elapsed before a staff could be organized for them all.

479. For the Larkhána Division no staff was supplied before the close of the year. In the Mehar Division the Executive Engineer, Mr. Gompertz, joined early in February, and additions to his staff were made as rapidly as possible. Mr. Graham and his staff commence work in the Sehwan Division on the 12th December; and in the Kotri Division the Executive Engineer, Mr. Hunt, and his staff were present on 1st December.

- |   | STATE.           |
|---|------------------|
| 480. No work done. No staff organized. The Executive Engineer, Captain Jopp, R. E. joined in the middle of March.   | Larkháná.        |
| 481. The line cleared and side widths marked out. A commencement made on the bank and in moulding bricks.   | Mehar.           |
| 482. The line cleared and side widths marked out. A number of trial pits sunk at the Sehwan hills, to determine whether the line could be carried on the debris at the foot of the rocks ; trial excavation made, and groins commenced at the Sunn river ; embankment of about one and a half miles of line thrown up, and a commencement made of brick-making and stone quarrying. | Schwán Division. |
| 483. Line cleared, side widths marked out, and a commencement made on the bank. Work was deferred here, as a proposal had been submitted to execute the whole of this Division by contract. It was subsequently decided that a commencement, at least, should be made by departmental agency, and work has since been vigorously forwarded.   | Kotrí Division.  |

#### RAJPUTANA STATE RAILWAY.

- |   |                               |
|---|-------------------------------|
| 484. During the year 1872-73 the works on the Rájputáná State Railway within Punjáb territory, for the line from Dehli to Rewárá, with the Salt branch, have been completed, and the first train ran to Rewárá on the 21st October.   | Completion of Line.           |
| 485. The several station buildings have been completed, including a small passenger station at Dehli, with engine-shed and watering arrangements, also a platform for local goods traffic and a transfer platform in the East India Railway yard, where through goods will be transferred from the broad to the narrow gauge wagons and <i>vice versa</i> . | Station Buildings.            |
| 486. Owing to the non-receipt of rolling-stock, the line is not yet open for general traffic ; but since the middle of February salt has been carried from the Sultánpúr fields in ballast wagons ; the amount carried up to the end of March 1873 being 34,523 maunds.   | Non-receipt of rolling stock. |
| 487. The total cost of the Dehli-Rewárá line has been, up to the 31st March 1873, Rs 21,20,909, and of the Salt branch Rs 1,96,300 ; the former amount includes some establishment charges properly debitable to the extension line, but which it has been found impossible to separate.  | Cost of line.                 |

## STATE.

Extension to Bandí-  
kúrí.

488. In August 1872 the sanction of Government was given to the estimates for the extension of the Dehli-Rewáří line through Alwar to a junction with the Agra-Jaipúr line, at a place called Bandíkúrí.

489. This extension runs for six miles in British territory, then for 11 miles through the territory of the Rájah of Nábhá ; at the 17th mile it enters the Alwar State.

490. Immediately on the work being sanctioned, steps were taken to obtain possession of the land and to start the work, and by the end of March all the earth-work on these 17 miles of line was completed, and the masonry of 17 culverts built up to girder level.

491. The long viaduct over the Saubí River, consisting of 73 spans of 22 feet, was well in hand ; both up and down stream curtain walls being finished, and a large quantity of the flooring, together with the superstructure of 11 piers and one abutment which were ready for the girder bed stones.

Bháváí Station.

492. The passenger station building at Bháváí was nearly finished, as well as the platform wall and the ash-pit ; the station well was sunk 20 feet, and a second 20 feet of masonry built up. This station is nine miles from Rewáří, the next station is at Ajeráká, within the Alwar State.

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# APPENDIX A.

[ Imperial. ]

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, IMPERIAL, FOR THE YEAR 1872-73.

Section A.—Ordinary.

SERVICE HEADS.								Grants as per Budget Orders.	Final grant at end of year.	Outlay.
								Rs-	Rs-	Rs-
ORIGINAL WORKS.										
Military	...	...	...	...	...	...	...	51,000	1,37,400	1,13,907
Civil Buildings	...	...	...	...	...	...	...	39,000	19,000	9,353
								90,000	1,56,400	1,23,260
REPAIRS.										
Military	...	...	...	...	...	...	...	56,250	73,250	60,119
Civil Buildings	...	...	...	...	...	...	...	10,000	10,000	8,870
								66,250	83,250	68,989
Establishment	...	...	...	...	...	...	...	15,650	56,650	46,477
Tools and Plant	...	...	...	...	...	...	...	3,100	3,100	522
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Net additional grant sanctioned during year	...	...	...	...	...	...	...	1,24,400	...	...
Total Outlay in India								2,99,400	2,99,400	2,39,248
SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE.										
New supplies	...	...	...	...	...	...	...	...	} 21,000	{ 3,578 1,966 1,386 ...
Repairs	...	...	...	...	...	...	...	...		
Establishment	...	...	...	...	...	...	...	...		
Profit and Loss	...	...	...	...	...	...	...	...		
Additional grant sanctioned during year	...	...	...	...	...	...	...	21,000	...	...
Total Outlay in India								21,000	21,000	6,930
GRAND TOTAL								3,20,400	3,20,400	2,46,178

  

Expenditure on Imperial Works from funds supplied in addition to Budget grant.								Amount of contribution.		Outlay.
Civil Buildings	...	...	...	...	...	...	...	6,616		4,406

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PART II—continued.

ACCOUNT OF APPROPRIATION FROM IMPERIAL FUNDS DURING 1872-73, ARRANGED BY HEADS OF SERVICE.

Section B.—Ordinary Expenditure only.

SERVICE HEADS.	Grants as per Budget Orders.	Final grant at end of year.	Outlay.
	Rs.	Rs.	Rs.
<b>MILITARY.</b>			
Original Works ... ..	51,000	1,37,400	1,18,907
Repairs ... ..	56,250	73,250	60,119
Establishment ... ..	10,750	49,400	41,921
Tools and Plant ... ..	2,128	2,725	473
Additional grant sanctioned during year ... ..	1,42,647	...	...
	2,62,775	2,62,775	2,16,420
<b>OTHER SERVICES.</b>			
<i>Civil Buildings.</i>			
Original Works ... ..	39,000	19,000	9,853
Repairs ... ..	10,000	10,000	8,870
Establishment ... ..	4,900	7,250	4,556
Tools and Plant ... ..	972	875	49
	54,872	36,625	22,828
Less reduction in grant ... ..	18,247	...	...
	36,625	36,625	22,828
<b>SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE.</b>			
New supplies ... ..	...	21,000	3,578
Repairs ... ..	...		1,966
Establishment ... ..	...		1,386
Additional grant sanctioned during year ... ..	21,000	...	...
	21,000	21,000	6,930
<b>TOTAL ORDINARY EXPENDITURE ...</b>	<b>3,20,400</b>	<b>3,20,400</b>	<b>2,46,178</b>

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# APPENDIX A—continued.

## PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNT OF THE PUNJAB FOR 1872-73.

PARTICULARS.	Amount.	REFERENCES.
	Rs.	
<b>ADDITIONS.</b>		
<b>BARRACK DEPARTMENT.</b>		
For barrack furniture for Frontier Stations ...	21,000	Government of India's No. 602 A-G dated 15th July 1872.
<b>ORIGINAL WORKS.</b>		
For extension of Gurkhá Lines, Abbottabád ...	85,000	Government of India's No. 306 A-B dated 5th August 1872.
For Outpost on Bannú Frontier ...	10,000	Government of India's No. 49 A-B dated 30th January 1873.
For Family Barracks in Lines of Native Infantry Regiments, Kohát.	7,000	Government of India's No. 107 A-G dated 27th February 1873.
For wells for Cavalry and Artillery Lines at Edwardesabád.	4,000	
Additional grant for Outpost at Sabzīl-kī-Kót, Deráját.	3,000	
For Minor Works, Military ...	10,000	Government of India's No. 468 A-G dated 2nd May 1872. Government of India's No. 134 A-G dated 12th March 1873.
Ditto ditto ...	5,000	Government of India's No. 1017 A-G dated 13th December 1872.
Ditto ditto ...	12,000	Government of India's No. 107 A-G dated 27th February 1873.
Ditto ditto at Jhelam ...	400	Government of India's No. 368 A-B dated 13th September 1872.
<b>REPAIRS.</b>		
For repairs to buildings at Abbottabád ...	8,000	Government of India's No. 306 A-B dated 5th August 1872.
Ditto ditto at Jhelam ...	4,000	Government of India's No. 368 A-B dated 13th September 1872.
Additional grant for repairs ...	5,000	Government of India's No. 107 A-G dated 27th February 1873.
<b>ESTABLISHMENT.</b>		
Additional grant for Establishment ...	11,000	Government of India's No. 306 A-B dated 5th August 1872.
Ditto ditto ...	30,000	Government of India's No. 134 A-G dated 12th March 1873.
Total Additions ...	1,65,400	
<b>REDUCTIONS.</b>		
Imperial grant for Telegraph Office at Ambálah transferred to Bengal.	20,000	Government of India's letter No. 209 A-S dated 13th September 1872.
Total Reduction ...	20,000	
TOTAL ADDITION ...	1,45,400	

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# APPENDIX B.

[ Provincial. ]

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, PROVINCIAL, FOR THE YEAR 1872-73.

### Section A.—Ordinary.

SERVICE HEADS.								Grants as per Budget Orders.	Final grant at end of year.	Outlay.
								Rs	Rs	Rs
ORIGINAL WORKS.										
Civil Buildings	...	...	...	...	...	...	...	8,28,000	6,29,685	4,84,805
Communications	...	...	...	...	...	...	...	5,34,000	6,74,262	2,48,931
Miscellaneous Public Improvements	...	...	...	...	...	...	...	13,000	31,138	8,127
Total								13,75,000	13,35,085	6,91,363
REPAIRS.										
Civil Buildings	...	...	...	...	...	...	...	1,05,000	1,05,000	80,508
Communications	...	...	...	...	...	...	...	11,67,000	12,10,000	8,61,339
Miscellaneous Public Improvements	...	...	...	...	...	...	...	75,000	75,000	2,959
Total								13,47,000	13,90,000	9,44,806
Establishment	...	...	...	...	...	...	...	5,68,350	5,98,350	3,76,268
Tools and Plant	...	...	...	...	...	...	...	25,000	25,000	18,430
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Additional grant sanctioned during year	...	...	...	...	...	...	...	33,085	...	...
Total								33,48,435	33,48,435	20,30,867
Less reduction in Stock	...	...	...	...	...	...	...	...	...	40,245
								33,48,435	33,48,435	19,90,622
Less reduction in balance of London Stores, Ordinary	...	...	...	...	...	...	...	...	...	52,469
NET OUTLAY								33,48,435	33,48,435	19,38,153
Expenditure on Provincial Works from funds supplied in addition to Budget grant.									Amount of contribu- tion.	Outlay.
ORIGINAL WORKS.										
Civil Buildings	...	...	...	...	...	...	...	...	1,806	1,563

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## APPENDIX B.

### PART I—continued.

#### ACCOUNT OF APPROPRIATION FROM PROVINCIAL FUNDS DURING 1872-73, ARRANGED BY HEADS OF SERVICE.

##### Section B.—Ordinary Expenditure only.

SERVICE HEADS.							Grants as per Budget Orders.	Final grant at end of year.	Outlay.
							Rs.	Rs.	Rs.
Civil Buildings	...	...	...	{	Original Works	..	8,28,000	6,29,685	4,34,305
							1,05,000	1,05,000	80,508
Communications	...	...	...	{	Original Works	...	5,34,000	6,74,262	2,48,931
							11,67,000	12,10,000	8,61,339
Miscellaneous Public Improvements				{	Original Works	...	13,000	31,138	8,127
							75,000	75,000	2,959
Establishment	...	...	...	...	...	...	5,68,350	5,98,350	3,76,268
Tools and Plant	...	...	...	...	...	...	25,000	25,000	18,430
Profit and Loss	...	...	...	...	...	...	...	...	...
Additional grant sanctioned during the year	...	...	...	...	...	...	33,085	...	...
							33,48,435	33,48,435	20,30,867
<i>Less—</i>									
Decrease in Stock							...	...	92,714
Decrease in balance of London Stores, Ordinary, 52,469							...	...	...
NET OUTLAY							33,48,435	33,48,435	19,38,153

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### PART II.

#### DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNT, PROVINCIAL, FOR 1872-73.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>		
	Rs.	
Transferred from the Civil Department. Budget for constructing a Thánah at Khángah, in the Gujránwála District.	8,085	Punjab Government, Public Works Department, No. 3943 dated 12th September 1872.
Additional grant for Establishment	30,000	Punjab Government, Civil Department, No. 1110 dated 14th Sept. 1872.
Total Additions	33,085	
<b>REDUCTIONS.</b>		
<i>Nil.</i>		
Total Reductions	...	
NET ADDITION	33,085	

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# APPENDIX C.

[ Local Funds. ]

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, LOCAL, FOR THE YEAR 1872-73.

### Section A.—Ordinary.

SERVICE HEADS.								Grants as per Budget Orders.	Final grant at end of year.	Outlay.
								Rs	Rs	Rs
ORIGINAL WORKS.										
Civil Buildings	...	...	...	...	...	...	...	59,600	59,600	42,524
Agricultural	...	...	...	...	...	...	...	10,500	10,500	10,242
Communications	...	...	...	...	...	...	...	3,02,280	3,01,530	4,85,870
Miscellaneous Public Improvements	...	...	...	...	...	...	...	20,350	20,350	44,858
Reserve	...	...	...	...	...	...	...	89,050	89,050	...
Total								4,81,780	4,81,030	5,83,494
REPAIRS.										
Civil Buildings	...	...	...	...	...	...	...	17,900	17,900	18,458
Agricultural	...	...	...	...	...	...	...	15,910	15,910	15,270
Communications	...	...	...	...	...	...	...	2,68,870	2,69,620	4,19,499
Miscellaneous Public Improvements	...	...	...	...	...	...	...	81,300	81,300	1,08,639
Total								3,83,980	3,84,730	5,61,866
Establishment	...	...	...	...	...	...	...	77,350	77,350	2,63,398
Tools and Plant	...	...	...	...	...	...	...	...	...	1,923
Profit and Loss	...	...	...	...	...	...	...	...	...	...
TOTAL OUTLAY								8,93,110	8,93,110	14,10,681
Expenditure on Local Works from funds supplied in addition to Budget grant.									Amount of contribution.	Outlay.
ORIGINAL WORKS.										
Miscellaneous Public Improvements	...	...	...	...	...	...	...	...	32,933	32,933

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## APPENDIX C.

### PART I—continued.

#### ACCOUNT OF APPROPRIATION FROM LOCAL FUNDS DURING 1872-73, ARRANGED BY HEADS OF SERVICE.

##### *Section B.—Ordinary Expenditure only.*

SERVICE HEADS.								Grants as per Budget Orders.	Final grant at end of year.	Outlay.
								Rs	Rs	Rs
Civil Buildings	...	...	...	{ Original Works				59,600	59,600	42,524
				{ Repairs				17,900	17,900	18,458
Agricultural	...	...	...	{ Original Works				10,500	10,500	10,242
				{ Repairs				15,910	15,910	15,270
Communications	...	...	...	{ Original Works				8,02,280	8,01,530	4,85,870
				{ Repairs				2,68,870	2,69,620	4,19,499
Miscellaneous Public Improvements				{ Original Works				20,350	20,350	44,858
				{ Repairs				81,300	81,300	1,08,689
Establishment	...	...	...	...	...	...	...	77,350	77,350	2,63,398
Tools and Plant	...	...	...	...	...	...	...	...	...	1,923
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Reserve	...	...	...	...	...	...	...	89,050	89,050	...
TOTAL OUTLAY								8,93,110	8,93,110	14,10,681

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### PART II.

#### DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNT, LOCAL, FOR 1872-73.

PARTICULARS.	Amount.	REFERENCES.
<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>

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# APPENDIX D.

[ Irrigation. ]

## PART I.

APPROPRIATION ACCOUNT OF IRRIGATION WORKS, (IMPERIAL) FOR THE YEAR 1872-73.

*Extraordinary and Ordinary.*

SERVICE HEADS.										Grant as per Budget Orders.	Final grant at end of year.	Outlay.
										Rs	Rs	Rs
CAPITAL.												
EXTRAORDINARY.												
Works	...	...	...	...	...	...	...	...	...	18,46,602	19,42,522	2,05,504
Establishment	...	...	...	...	...	...	...	...	...	9,70,348	7,28,028	2,52,557
Plant	...	...	...	...	...	...	...	...	...	1,83,050	22,450	— 10,561
Suspense Balances	...	...	...	...	...	...	...	...	...	...	...	49,943
Total										30,00,000	26,93,000	4,97,443
Less Receipts on Capital Account	...	...	...	...	...	...	...	...	...	...	...	7,293
Net outlay										30,00,000	26,93,000	4,90,150
Less Expenditure in England	...	...	...	...	...	...	...	...	...	4,000	4,000	...
Reduction										— 3,07,000	...	...
Net Expenditure in India										26,89,000	26,89,000	4,90,150
ORDINARY.												
Works	...	...	...	...	...	...	...	...	...	57,700	57,700	48,434
Establishment	...	...	...	...	...	...	...	...	...	13,130	13,130	— 687
Plant	...	...	...	...	...	...	...	...	...	...	...	13,566
Profit and Loss	...	...	...	...	...	...	...	...	...	...	...	— 22
Suspense Balances	...	...	...	...	...	...	...	...	...	...	...	— 1,27,887
Total										70,830	70,830	— 66,596
Less Receipts on Capital Account	...	...	...	...	...	...	...	...	...	...	...	31,466
Net outlay										70,830	70,830	— 98,062
Less Expenditure in England	...	...	...	...	...	...	...	...	...	...	...	...
Net Expenditure in India										70,830	70,830	— 98,062
TOTAL CAPITAL										27,59,830	27,59,830	3,92,088
REVENUE.												
Works	...	...	...	...	...	...	...	...	...	49,614	49,614	61,151
Maintenance and Repairs	...	...	...	...	...	...	...	...	...	4,46,100	4,46,100	4,16,053
Establishment	...	...	...	...	...	...	...	...	...	6,62,870	6,62,870	6,23,561
Tools and Plant	...	...	...	...	...	...	...	...	...	30,700	30,700	6,066
Profit and Loss	...	...	...	...	...	...	...	...	...	...	...	68
Unappropriated out of Reserve of Rs 2,00,000	...	...	...	...	...	...	...	...	...	9,886	9,886	...
Total										11,99,170	11,99,170	11,06,899
Less Expenditure in England	...	...	...	...	...	...	...	...	...	4,000	4,000	...
Net Expenditure in India										11,95,170	11,95,170	11,06,899
TOTAL IMPERIAL										39,55,000	39,55,000	14,98,987

# APPENDIX D.

## PART I—concluded.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS, (IMPERIAL) FOR THE YEAR 1872-73.

#### Ordinary.

SERVICE HEADS.								Grant as per Budget Orders.	Final grant at end of year.	Outlay.
CONTRIBUTION.								Rs.	Rs.	Rs.
CAPITAL.										
Ordinary.										
Works	...	...	...	...	...	...	...	...	...	14,28,660
Establishment	...	...	...	...	...	...	...	...	...	4,63,587
Plant	...	...	...	...	...	...	...	...	...	27,676
Profit and Loss	...	...	...	...	...	...	...	...	...	66
Suspense Balances	...	...	...	...	...	...	...	...	...	94,937
Total								...	...	20,14,926
Less Receipts on Capital Account	...	...	...	...	...	...	...	...	...	8,624
Net outlay								...	...	20,06,302
Less Expenditure in England	...	...	...	...	...	...	...	...	...	...
Net Expenditure in India								...	...	20,06,302
REVENUE,										
Works	...	...	...	...	...	...	...	64,076	64,076	5,300
Maintenance and Repairs	...	...	...	...	...	...	...	...	...	30,741
Establishment	...	...	...	...	...	...	...	...	...	...
Plant	...	...	...	...	...	...	...	...	...	...
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Total								64,076	64,076	36,041
TOTAL CONTRIBUTION								64,076	64,076	20,42,348
GRAND TOTAL								40,19,076	40,19,076	35,41,330

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# APPENDIX D.

## PART II.

APPROPRIATION ACCOUNT OF IRRIGATION WORKS (IMPERIAL) FOR THE YEAR 1872-73.  
Distribution of Extraordinary and Ordinary Outlay.

	New works.	Maintenance.	Establishment.	Tools and Plant.	Profit and Loss.	Suspense Balances.	Total.	Less Receipts on Capital Account.	Net expenditure of the year.	Less expenditure in England.	Net outlay in India.	Grant as per Budget orders.	Final grant at end of year.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
IMPERIAL CAPITAL.													
Extraordinary.													
Western Jamna Canal	21,179	...	1,05,197	195	...	-23,337	1,03,284	342	1,02,892	...	1,02,892	5,14,202	2,23,000
Bari Doab Canal	1,22,694	...	1,31,636	700	...	93,682	3,48,712	5,003	3,43,709	...	3,43,709	6,94,715	4,29,370
Sirhind Canal	61,076	...	-1,05,553	-13,195	...	-18,615	-76,287	1,847	-78,134	...	-78,134	15,37,300	18,78,000
Special Survey Lower Bari Doab Canal	2,646	...	37,235	439	...	1,207	41,527	4	41,523	...	41,523	1,20,451	30,630
Ditto Derajat	1,324	...	66,174	901	...	-1,983	66,416	89	66,327	...	66,327	68,447	67,000
Swat River Canal	...	...	28,868	399	...	-1,011	28,256	8	28,248	...	28,248	37,885	34,000
Reserve	...	...	...	...	...	...	...	...	...	...	...	27,000	27,000
Additional grant or reduction in grant	...	...	...	...	...	...	...	...	...	...	...	-8,11,000	...
Total	9,08,919	...	2,52,557	-10,561	...	49,943	5,00,858	7,293	4,93,565	...	4,93,565	26,89,000	26,89,000
Less refund of Outlay from Ordinary grant	3,415	...	...	...	...	...	-3,415	...	-3,415	...	-3,415	...	...
Total A.	2,05,504	...	2,52,557	-10,561	...	49,943	4,97,443	7,293	4,90,150	...	4,90,150	26,89,000	26,89,000
Ordinary.													
Western Jamna Canal	13,356	...	2,357	...	...	17,961	33,674	...	33,674	...	33,674	...	10,700
Bari Doab Canal	3,000	...	23	...	...	-88,452	-85,429	...	-85,429	...	-85,429	...	...
Sirhind Canal	-1,556	...	-7,198	-1,333	-66	56,742	-66,895	15	-66,880	...	-66,880	...	...
Lower Satlaj and Chinab Inundation Canals	955	...	174	...	...	456	1,585	1	1,584	...	1,584	...	...
Upper Satlaj Inundation Canals	26,399	...	-4,845	...	...	-100	-31,344	...	-31,344	...	-31,344	...	...
Indus Inundation Canals	38,834	...	8,802	...	...	-1,010	46,626	...	46,626	...	46,626	48,130	52,130
Madhopur Workshops	16,829	...	...	14,399	44	...	31,772	31,480	292	...	292	22,700	8,000
Reserve	...	...	...	...	...	...	...	...	...	...	...	...	...
Additional grant or reduction in grant	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	45,019	...	-687	13,566	-22	-1,27,887	-70,011	31,466	-1,01,477	...	-1,01,477	70,830	70,830
Add refund of Outlay to Extraordinary grant	3,415	...	...	...	...	...	3,415	...	3,415	...	3,415	...	...
Total B.	48,434	...	-687	13,566	-22	-1,27,887	-66,596	31,466	-98,062	...	-98,062	70,830	70,830
TOTAL CAPITAL A. AND B.	2,53,938	...	2,51,870	3,006	-22	-77,944	4,30,847	38,759	3,92,088	...	3,92,088	27,59,830	27,59,830

# APPENDIX D.

## PART II—concluded.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS, (IMPERIAL) FOR THE YEAR 1872-73. Distribution of Extraordinary and Ordinary Outlay.

	New works.	Maintenance.	Establishment.	Tools and Plant.	Profit and Loss.	Suspense Balances.	Total.	Less Receipts on Capital Account.	Net expenditure of the year.	Less expenditure in England.	Net outlay in India.	Grant as per Budget orders.	Final grant at end of year.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Brought forward A. and B. ...	2,53,938	...	2,51,870	3,005	-22	-77,944	4,30,847	38,759	3,92,088	...	3,92,088	27,59,830	27,59,830
REVENUE.													
Western Jamna Canal ...	20,879	1,18,134	2,57,416	1,878	...	...	3,98,307	...	3,98,307	...	3,98,307	3,84,785	4,25,765
Dehli and Gurgson Irrigation Works ...	...	3,004	7,859	100	...	...	10,963	...	10,963	...	10,963	...	...
Bari Doab Canal ...	1,847	1,08,541	2,02,458	2,856	...	...	9,15,702	...	3,15,702	...	3,15,702	...	...
Madhopur Workshops...	...	...	...	...	...	...	42,123	...	42,123	...	42,123	23,946	19,946
Lower Satlaj and Chinab Inundation Canals ...	87	3,968	37,991	127	...	...	1,55,001	...	1,55,001	...	1,55,001	46,665	48,965
Upper Satlaj Inundation Canals ...	29,664	56,936	68,253	148	...	...	1,80,464	...	1,80,464	...	1,80,464	1,06,164	1,38,654
Indus Inundation Canals ...	8,724	1,21,470	49,343	957	68	...	4,339	...	4,339	...	4,339	85,137	1,26,437
Shahpur Canals ...	...	4,000	339	...	...	...	...	...	...	...	...	4,215	4,215
Minor Works ...	...	...	...	...	...	...	...	...	...	...	...	29,960	29,960
Reserve ...	...	...	...	...	...	...	...	...	...	...	...	1,77,300	9,886
Less expenditure in England ...	...	...	...	...	...	...	...	...	...	...	...	-4,000	...
Total C. ...	61,151	4,16,053	6,23,551	6,066	68	...	11,06,899	...	11,06,899	...	11,06,899	11,95,170	11,95,170
TOTAL IMPERIAL, A. B. AND C. ...	3,15,089	4,16,053	8,75,431	9,071	46	-77,944	15,37,746	38,759	14,98,987	...	14,98,987	39,55,000	39,55,000
CONTRIBUTION.													
CAPITAL ORDINARY.													
Sirhind Canal ...	14,28,660	...	4,63,587	27,676	66	94,937	20,14,926	8,624	20,06,302	...	20,06,302	...	...
REVENUE.													
Lower Satlaj and Chinab Inundation Canals ...	4,095	27,870	...	...	...	...	31,965	...	31,965	...	31,965	60,000	60,000
Upper Satlaj Inundation Canals ...	1,205	2,871	...	...	...	...	1,205	...	1,205	...	1,205	1,205	1,205
Western Jamna Canal ...	...	...	...	...	...	...	2,871	...	2,871	...	2,871	2,871	2,871
Total ...	5,300	30,741	...	...	...	...	36,041	...	36,041	...	36,041	64,076	64,076
GRAND TOTAL ...	17,49,049	4,46,794	13,39,018	36,747	112	16,993	35,88,713	47,383	35,41,330	...	35,41,330	40,19,076	40,19,076

I. P. WESTMORLAND, Captain, R. E.  
Controller Public Works Accounts, Punjab.

# Appendix E.

Statement showing the progress made in construction of Railways in the Punjab, and the state of their working from 1st April 1871 to 31st March 1872.

NAME OF RAILWAY.	Mileage open during the year.	Total mileage open.	PASSENGERS DURING THE YEAR.				Receipts from merchandise and miscellaneous.	Total Receipts.	Working Expenses.	Net profits.	No. of European Staff.	No. of Native Staff.	Total Capital expended from commencement.	REMARKS.
			1st Class.	2nd Class.	Intermediate Class.	3rd Class.	Total.							
Punjab and Dehli Sections ...	...	M. C. 557 3	12,993	39,830	12,089	18,18,960	18,83,872	16,49,248	35,57,880	38,39,818	410	439	Re- 6,76,99,301	Includes stores of the value of Re- 61,70,748-8-11 on 31st December 1871.
Sindh Section ...	...	116 10	2,350	10,634	...	66,262	79,246	7,24,947	8,39,065	7,48,946	98	193	2,16,21,460	
Indus Steam Flotilla, about...	...	575 0	168	158	...	6,383	6,709	5,72,048	6,19,982	5,38,132	48	4	48,39,597	
Total ...	...	1,248 13	15,511	50,622	12,089	18,91,605	19,69,827	29,46,243	50,16,927	51,26,896	556	636	9,41,60,358	

Statement showing the progress made in construction of Railways in the Punjab, and the state of their working from 1st April 1872 to 31st March 1873.

NAME OF RAILWAY.	M.	1st Class.	2nd Class.	Intermediate Class.	3rd Class.	Total.	Receipts from merchandise and miscellaneous.	Total Receipts.	Working Expenses.	Net profits.	No. of European Staff.	No. of Native Staff.	Total Capital expended from commencement.	REMARKS.
Sindh, Punjab and Dehli Railway, Punjab and Dehli Line	567	10,996	24,746	12,940	18,97,132	19,45,814	18,68,167	38,44,530	34,43,314	4,01,216	...	...	6,82,17,855	* This number includes Eurasians as well.
Sindh Line ...	110	1,408	5,499	...	64,166	71,068	6,39,519	7,55,664	5,96,553	1,59,111	...	604	2,15,53,322	
Flotilla, about...	575	196	155	...	7,181	7,532	7,17,222	7,71,514	6,04,957	1,66,557	...	...	48,39,097	
Total ...	1,252	12,595	30,400	12,940	19,69,479	20,24,414	32,24,908	53,71,708	46,44,824	7,26,884	568	604	9,46,15,274	

CONSULTING ENGINEER'S OFFICE,  
LAHORE,  
Dated 7th August 1873.

CHARLES POLLORD, LIEUT.-COLONEL, R. E.,  
Consulting Engineer for Guaranteed Railways Lahore.



## Appendix F.

### STATEMENT SHOWING OUTLAY INCURRED ON CONSTRUCTION OF THE PUNJAB NORTHERN STATE RAILWAY DURING THE OFFICIAL YEAR 1872-73.

<i>Heads of Account.</i>										
Preliminary expenses.	Land.	Construction of Line.	Ballast and Permanent-way.	Stations.	Plant.	Rolling-stock.	Establishment.	Contingencies.	Decrease in balance of Suspense Account.	Total outlay.
3,773	11,755	23,13,763	5,60,152	63,883	*3,20,239	32,547	5,82,522	18,820	2,10,143	36,97,311

\* Includes Rs- 1,077 on account of Electric Telegraph.

### STATEMENT SHOWING OUTLAY INCURRED ON CONSTRUCTION OF THE INDUS VALLEY STATE RAILWAY DURING THE OFFICIAL YEAR 1872-73.

<i>Heads of Account.</i>										
Preliminary expenses.	Land.	Construction of Line.	Ballast and Permanent-way.	Stations and Buildings.	Plant.	Rolling-stock.	Establishment.	Contingencies.	Increase to balance of Suspense Account.	Total outlay.
16,722	13,170	5,63,786	30,720	1,84,339	81,260	650	5,60,626	30,808	6,27,854	21,09,935

### STATEMENT SHOWING OUTLAY INCURRED ON CONSTRUCTION OF THE RAJPUTANA STATE RAILWAY (DEHLI DIVISION) DURING THE OFFICIAL YEAR 1872-73.

<i>Heads of Account.</i>										
Preliminary expenses.	Land.	Construction of Line.	Ballast and Permanent-way.	Stations and Buildings.	Plant.	Rolling-stock.	Establishment.	Contingencies.	Increase to balance, &c.	Total outlay.
..	...	81,218	7,71,545	99,354	18,416	61,752	1,02,468	3,888	...	11,38,641





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ANNUAL

PROGRESS REPORT

OF

PUBLIC WORKS IN PUNJAB,

FOR THE YEAR

1873-74.



LAHORE:  
PUBLIC WORKS DEPARTMENT PRESS.  
1874.



## Note to accompany the Annual Progress Report of Public Works in Punjab for 1873-74.

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This Report embraces, besides the Provincial Works, Imperial Works of certain classes, viz., the Military Works of the Frontier Force, and of three stations not belonging to the Frontier,—Hissár (Cattle Farm), Jhelam and Tallagang (Cantonments), and Imperial Civil Works of the Post Office and Telegraph Departments, Irrigation Works, and State Railways. Of the greater part of the Military Works in the Punjab the Local Government now has no charge and renders no account. They are managed by the Military Works Branch under the direct orders of the Government of India. The Imperial Works connected with the Salt Mines at Pind Dádan Khán, and the wire tramway for transport of the salt from the mines to the River Jhelum, and across the river, are directly under the Supreme Government in the Department of Revenue and Commerce. The State Railways, though likewise directly under the Government of India, in the Public Works Department, are annually reported on through the Local Government. The other Imperial Works are under the Provincial Public Works Establishments.

2. In the Trans-Indus Divisions the Engineers have had in their hands, for construction and repair, a number of small but important works established for frontier defence, check of depredations, and maintenance of peace ; and, in all the stations of the Frontier Force, works for the accommodation, health and comfort of the troops and protection of Military stores.

3. The regular Cantonments of the Frontier Divisions are seven in number, (exclusive of Peshawur, Nowshera, and Cherat, which are under the Military Works Branch). There are fifty-eight fortified outposts (excluding those belonging to Peshawur) and a few minor out-look towers belonging to some of these outposts ; the outposts and towers garrisoned partly by the regular troops, partly, (on the Bunnoo and Deráját frontiers), by Frontier Militia. The Fort of Akalgurh at Dera Ismael Khan has a garrison of British Infantry, detached from Mooltan. The roads to and between all the Frontier Stations and Posts,—those belonging to the Peshawur Division and the Military Works Branch as well as those under the Local Government,—are in charge of the Provincial Public Works Officers.

4. An important piece of work connected with one of the Frontier Stations which has, for some years past, with varying urgency, demanded attention and called for considerable labour and outlay, is the protection of the Cantonment and Civil Station of Dera Ismael Khan from the encroachments of the Indus (para. 17 of the Report). The river has at different times cut into the banks above and near the station, and seriously threatened its safety. The Cantonment was built between the city and the river. The Fort of Akalgurh, in which are now the barracks of the British Infantry detachment, is further removed from the river and in a place of safety. The Indus, shifting its course from year to year, has had to be met by correspondingly varying arrangements for resisting or for guiding it. The protective works have generally been of both these kinds—(1), spurs and banks at some distance above the station to divert the stream from the side attacked, and to induce the silting up of the heads of branch channels which would admit the river on that side ; and (2), defensive works on the river bank at the station itself, for the direct preservation of points attacked. Considerable, but not invariable, success has attended these works in past years. The uncertainty of the movements of the river requires much watchfulness, and occasionally makes heavy and unforeseen demands on the funds at disposal of the Government and on the exertions of the engineers.

5. It is noticed at para. 97 of the Report that the construction of the Police Station at Miánwáli, on the other side of the Indus, was suspended, as the river was threatening that station. It has since carried away the house occupied by the Assistant Commissioner as a dwelling and court-house (originally built many years ago as a travellers' bungalow), and some new arrangements will now have to be made at that place.

6. The communications in the Trans-Indus districts are still in need of much improvement. Some of the principal roads pass through tracts of country which are liable to be flooded, (and, in exceptional seasons, for a great length of time), from the river, from the inundation canals, from the bursting of field embankments, and from the torrents which come down from the western hills. To construct the roads so as to be permanently open throughout, will be a work of great cost, which can only be accomplished gradually. It is being done by degrees as funds permit. Between many of the minor frontier posts roads of the simplest kind answer their purpose. A track cleared of stones for a good width, permitting of the free and rapid movement of Cavalry, and having the descents into the nullahs cut to a moderately easy gradient,—this, in many places, is all that is required or attempted. The minor defensive posts and frontier rest-houses and roads are generally taken charge of by the Officers of the Frontier Force ; and the repairs are executed under their direction, by local labour, or by the men of the Militia who garrison certain of the posts.

7. Some progress has been made in the needful improvement of the water-supply of the frontier stations and outposts. Additional boring appliances have lately been received from England for continuing the endeavour to procure good water at outposts where the present supply is of bad quality or inconveniently distant.

8. The works executed for the various branches of the Civil Administration during the past year have been for the most part of an ordinary kind,—the continuation of the arrangements for providing suitable accommodation in place of indifferent or unsuitable old buildings altered and adapted, or others hastily constructed, in the early days of British occupation of the Punjab. Much still remains to be done to supply the accommodation required, especially for the Land Revenue and Police Departments.

9. Good progress has been made with improved Jail buildings. The only large new works of this class immediately required are the Jail at Umritsur (in progress) and that at Jullundur (not yet commenced). Every District will have a Jail at its head-quarters station, except Hoshiárpur, for which provision is to be made in the new Jail at Jullundur. The gradual provision of solitary cells in all the Jails, in the established proportion also of quarantine cells and civil wards, will be seen from the Report (paras. 45 to 67) to be making good progress. For the extension of the paper-manufactories at certain of the Jails additions are being made to the buildings. The large current demands of the various Civil Departments for the ordinary paper made in the Jails are increased in certain Districts by the Settlement operations in progress ; and the enlargement of some of the Jail paper-manufactories has reference to this present and prospective demand.

10. A number of buildings for the Educational Department, mostly of small size, have been erected during the past year. Many of these buildings, as of other Civil buildings, particularly in the parts of the Districts distant from main roads, have been superintended by the Civil establishments. The principal Educational building in progress during the past year is the Lahore College (para. 121 of the Report), a building of good design, occupying an advantageous site, of which the deep foundations were completed before the close of the year.

11. Good progress has been made from year to year with the extension and improvement of the communications throughout the Punjab. The condition

of the Province now in this respect presents a satisfactory contrast with the state of things in the first years of British rule north and west of the Satlaj. The main highway from Ludíánah to Peshawur has been completed for some years, bridged throughout, except where metalled depressions were found a sufficient substitute for bridges, to pass the drainage, the water being of small depth and very temporary. At some of these places in the Trans-Indus section, where the force of the current in heavy floods is great, recent experience has indicated that it will be proper to erect bridges.

12. The great rivers on this line of Trunk Road are crossed by boat-bridges during the season of low water, generally from seven to eight months, and by ferries during the rest of the year. The boat-bridge on the Rávi at Lahore is maintained throughout the year. The bridges of the Sindh, Punjab and Delhi Railway across the Satlaj and Biás, close alongside of the Trunk Road, are unprovided with roadways for ordinary traffic. The boat-bridges at those places were given up on the completion of railway communication, the ferry being considered to meet sufficiently the wants of the road traffic when relieved by the railway. Both boat-bridges had to be re-established for a time when the railway communication was interrupted by the accidents to the bridges,—and again were given up when the railway bridges were restored. The Satlaj boat-bridge at Phillour was, by desire of the Government of India, re-constructed last year for the march of troops during the cold season. The Biás boat-bridge was not required. For troops marching through Lahore to and from the east of the Satlaj, the route by Ferozepore is equally suitable, being, within seven miles, the same length as the other. A boat-bridge is established annually at Ferozepore. The bridges of the Punjab Northern Railway across the Rávi, the Chináb and the Jhelam, now under construction, are meant to be used by the road traffic.

13. During the past year it was resolved that the permanent line of the Punjab Northern Railway should be on an embankment of its own, separate from the road, on which has been constructed the narrow-gauge line, which will be removed when the other is completed. The Trunk Road on which the railway has been laid, according to the previous intention, has necessarily been much cut up during the past year by the conveyance of railway materials and stores, and the limitation of the traffic, for a considerable time, to one-half of the road. Since the close of the year under review this temporary narrow-gauge railway on the Trunk Road has been completed to Wazírábád, which will now be the northern terminus, till the completion of the separate line on the Indian standard gauge. This question having been now definitely settled, rapid progress will be made with the construction of the permanent line, for which the land is now being taken up and occupied.

14. The Government of India, a short time ago, published its fore-casts of expenditure from Loan Funds on Railways and Irrigation Works, which, it observed, have, and will continue to have, an important bearing upon the finances of India. The two classes of works are appropriately considered together. Their connection is not limited to the arrangements by which the funds for their execution and maintenance are provided, and to their bearing upon the imperial finances. The mutual relations of increased production and increased facilities for transport of produce, and for secure and rapid inter-communication between different parts of the country, are of an importance more wide and more weighty. Especially in those times when an exceptional season or succession of seasons has caused a large local failure of production, and great inequality between the conditions of different parts of the country, the benefit is gained of the connection between irrigation works and means of communication whether by land or water. The large increase of secured cultivation in the Punjab, over a yearly extending irrigated area, (the details of which belong to the Annual Revenue Report of the Irrigation Department, not to the present Report which deals only with the progress of works), is increasing beneficially its exporting as well as its self-supporting power. And the continuous railway communication between the Punjab and Bengal has been turned to good account on the present occasion. Before the close of the year under review the Railway had conveyed from Punjab Stations upwards of 115,000 tons of grain to the North-Western Provinces and

Bengal, (para. 462 of the Report) ; and during the first four months of the present year a large export of grain by the railway continued.

15. It will be seen from the present Report that good progress has been made during the past year with works of both these kinds in the Punjab, Irrigation and Communications. An outlay of a million and a half on Irrigation Works during the next five years is proposed by the Government of India, and a considerable proportion of this amount will be expended on works in the Punjab. In addition to the works shown in the present Report to be in progress, some important new projects and plans for re-modelling existing canals have been prepared in detail, and are ready for execution. And the preliminary investigations and surveys for other projects are in hand.

16. On the State Railways,—*Punjab Northern, Indus Valley, and Rajpootana*,—a good amount of work has been done during the past year. The great bridges on the Peshawur line are unaffected, in the parts at present under construction, by the change of line and of gauge. The new line will, at the river crossings, adapt itself to the positions in which the bridges are being erected. And the whole arrangements are now in a position to advance rapidly and without interruption.

17. This line (*Punjab Northern*) is not at present to be classed specially among grain-exporting railways, and it does not come in contact with any of the chief works of irrigation, or pass through country benefited by them. But among the Irrigation Works projected are two which will affect country adjacent to the line of the completed railway, (paras. 441 and 443 of the Report). These are, the Swát River Canal for the irrigation of the Yusafzai plain north of the Cábul river, (a plain eminently suited for the cultivation of cereals, and now noted especially for the barley it produces) ; and the canal or canals for supplying water to part of the wide doáb between the Chináb and the Rávi. And if the *Punjab Northern Railway* is not notably a grain-exporting line under such circumstances as have lately presented themselves, it may, under altered circumstances, come to be of large value, for importation of food, to tracts of country more exposed to irregularities of seasons than Bengal.

18. The way in which the opened portion of the *Rajpootana Railway*, from Delhi to Rewári, has begun to meet and to create demands on the part of both passengers and goods, is shown in para. 579 of the Report.

19. The extensive preparatory operations, materials collected, works completed and in progress, on the *Indus Valley* line, and the works not commenced, which had to await the decision of the gauge question, are detailed in the section of the report relating to this railway (paras. 512 to 577), which will show that much has been done all along the line. On the first of the great bridges on this line across the Satlaj near Baháwalpur, work will be commenced when the river has fallen, in the beginning of the cold season (para. 533). The design for the other,—across the Indus near Sakkar,—(para. 549), is not yet definitely selected.

20. Roads for interior traffic throughout the Province have been improved and extended during the past year. Some of the roads have been subjected to unusual wear by the large amount of cart traffic towards the Railway Stations during the time of the extensive transport of grain to the Lower Provinces.

21. Since the abolition of the *Punjab Steam Flotilla* on the Upper Indus, two years ago, no endeavour has been made to establish steam traffic on any of the Punjab rivers. The character of the rivers with reference to navigation, and the limited amount of traffic, present and prospective, which the steamers would obtain, have not been considered to offer sufficient encouragement at present to further efforts in this direction. And a proposal to introduce a line of Government steamers on the Jhelam has for the present been set aside. This river is one of the least unfavorable for navigation, but the existing traffic, which is chiefly downwards, is for the most part sufficiently well served by native boats. And though regular steamers might give an impetus to the traffic in both direc-

tions, the probable amount of it does not at present warrant the cost of the experiment.

22. Circumstances may call for a renewal of the endeavours to establish or encourage steam navigation on this or some of the other Punjab rivers. If this is done, it is essential that vessels should be obtained much more specially adapted to the conditions under which they would be employed than any which have hitherto been tried on these difficult rivers. The combination of very shallow draught with high power is one which has long been attained elsewhere ; and this must be the kind of fitness presented by any steamers which would successfully ply on these rivers with regularity and safety. A greater draught, which occasions less difficulty on the Lower Indus, is a serious impediment on the upper rivers during great part of the year.

23. A steam ferry is maintained on the Chináb at the crossing of that river between Mooltan and Dera Ghazee Khan. The steamer is one of those belonging to the abolished Punjab Steam Flotilla, and is open to the objection which it presented when used for navigation on the Upper Indus, though it answers its present purpose moderately well.

24. The double ferry boat with central paddle worked by men (prisoners on a tread mill) continues to be used satisfactorily on the Indus at Dera Ghazee Khan. It is proposed to establish a boat-bridge at this place. It was expected that the boat-bridge now in use at Pind Dádan Khan on the Jhelam might already have been made available, on the completion of the wire tramway carrying the salt from the Kewra Mines to the opposite side of the river. The boat-bridge at that place exists almost entirely for the salt traffic. But it has not been considered advisable to dispense with the bridge till more full and continuous experience has been had of the working of the wire tramway.

25. An important addition has been made to the facilities for the traffic with Afghánistán through the Deráját by the construction of boat-bridges across the Indus at Dera Ismael Khan, and the united Chináb and Jhelam at Trimmu Ghát near Jhang. This through communication without ferries between the Deráját and the railway (Lahore and Mooltan) was opened for the first time last year.

26. Of the roads for aiding trade and travel to adjacent countries, the *Ladakh road* through Kulu and Láhoul is that to which immediate attention is being directed as one of the most important. The part within our own territory has been well made and maintained by the Civil Officers of the Kangra District and their special supervisor and other establishment. For laying out the continuation of it, on an improved line, through Kashmír territory, a Public Works Officer was specially deputed in the end of last year, and is now at work. This is the most serviceable trade route at present between Leh and the British Provinces. From Ladakh passing through Láhoul and Kulu, it enters the Kangra Valley at its upper or eastern end, and at Pálampur meets the cart-road by which wheeled conveyances can travel to the railway in two directions,—west along the Kangra Valley to Pathánkót, meeting there the metalled road to Umritsur ; and south by Kangra and Hoshiárpur to Jullundur.

27. The Kangra Valley cart-road is not bridged throughout. The greater number of the important streams are crossed by excellent bridges of stone, brick, or concrete arches, or of timber. Others remain which in the flood season present serious temporary obstacles to traffic, though they are crossed without any trouble at other seasons. Some more bridges on this road, as will be seen from the Report (paras. 247—252), have been completed or under construction during the past year. Some of the larger and more expensive bridges are deferred. During great part of the year their absence presents no great impediment to wheeled traffic. Across the stony channels, dry or carrying a slender stream, a roadway is cleared of stones, and the descents on either side are cut to an easy gradient. In place of bridges, paved causeways were constructed across two of the rivers, in the manner successfully practised elsewhere ; but the great slope of the channels in these two instances, and the violence of the torrents in flood, have greatly damaged the causeways.

28. The Káshgar Mission, on its return to India, in July of this year, was prevented from taking the route from Leh through Láhoul and Kulu in consequence of the partial destruction by an avalanche, in the end of last year, of the bridge across the Chandra river at Koksar. This bridge, of the description well known in these hills as a *sanga*, (formed of successive courses of timber with one end imbedded in masonry abutments, and projecting one beyond another till the central space can be spanned by single beams), was erected nine years ago. On information being received of the accident last spring, arrangements were made by the Civil Officers for its re-construction, and it has since been completed. At the same time it was determined to throw a wire rope suspension bridge across the river, a little lower down, opposite the village of Koksar ; and this is now being done.

29. The *Tibet Road* (paras. 193—198), which from Simla descends to the narrow valley of the Satlaj near Kotgarh, and follows the course of that river upwards, has been maintained in ordinary repair ; but the widening and improvement of it has not been extended during the past year. This improvement or re-construction is being carried on as funds become available. Arrangements have been made for a small extension this year. The present terminus of the improved road is at Jángi, 24 miles beyond Chini, and about 170 from Simla. The line follows generally the course of the river and the track of old roads, with amendment of the gradients where necessary to bring it to the accepted standard of a good practicable mule-road. From the confluence of the Spiti with the Satlaj it is meant to be continued both eastward by the Satlaj to the Tibet frontier at Shipki, whence there is a well used road to Garo, and also up the valley of the Spiti northward by Shalkur into Spiti.

30. No working parties of British soldiers have during the past year been employed on hill road work as in former years. There was no suitable work, of sufficient amount, in positions favorably situated for their employment. Some improvements of the roads near Simla were executed by parties of native soldiers, of the 32nd Pioneers.

31. The hill road to Murree from Rawul Pindee has been greatly improved by thinly metalling at small expense a narrow strip in the middle of the road, the whole way. Where the soil is hard and rocky, such roads, even under a considerable amount of wheel traffic, can be maintained generally in good order without metalling. Much of the Murree road is clay and soft soil, and this partial metalling has been of great service in preserving its surface, and in facilitating the increased use of the Government hill carts and other light vehicles. Many of the roads in the station of Murree have similarly been lightly metalled, with much advantage. Certain parts of the road from Kálka to Simla are about to be improved and protected likewise by partial metalling.

32. Under the Civil Officers many useful works for improvement of the appearance, comfort, and sanitary condition of towns have been executed,—street paving and drainage, wells and tanks, bathing places and public latrines, &c. The District Committees have initiated and carried out many new works and improvements throughout their Districts. There has been much improvement of District roads throughout the Province, and portions of several of these roads have been metalled. Though the District Executive establishments are not yet all in full working order, much progress has been made. The District Committees, and Municipalities of minor towns, are making gradual advance in the appreciation and exercise of their powers.

33. The town of Dera Bába Nának on the Rávi having been seriously menaced by the river, it has been necessary during the last two years to construct some protective works of a character generally similar to those successfully executed on the same river for the preservation of the walled enclosure of the Emperor Jahángír's tomb at Sháhdarah opposite Lahore. At Dera Nának, where the protective spurs thrown out from the bank had been partially destroyed by heavy floods (para. 309), endeavour has been made to draw part of the stream by an old



channel across a broad neck of land opposite the town, where the river forms a wide loop, so as to reduce the force of the attack upon the left bank on which the town stands. And in the floods which have occurred since the close of the year under review this has been in some measure effected. Part of the stream has taken the new course, relieving the protective spurs, by reducing the volume and force of the current which strikes them. A continuation of these guiding and defensive arrangements will be required this year during the season of low water.

34. On the Satlaj some protective spurs have been required to preserve the bank above the site of the railway bridge at Adamwahn, (para. 536), where the Indus Valley Railway will cross from the Mooltan District into the Bahawalpur territory.

35. An extensive new protective work of a different kind, which it has been necessary to take in hand during the past year, is the earthen embankment for the protection of the upper part of the Muzaffargarh District from the Indus overflowing its banks. The work is under the Officers of the Irrigation Branch. The twenty-seven miles of embankment, mentioned in paras. 451-2 of the report, were completed before the flood season. A long extension of this defensive work is required, for the preservation of a large area of cultivated country, and for the security of the land revenue now under process of revision. In connection with it the construction hereafter of a canal has been proposed, to be carried behind the embankment parallel to the river, for the purpose of supplying with water the small inundation canals which the line of embankment crosses, and which it will for a time deprive of their usual supply drawn direct from the river in the high-water season.

36. The employment of convict labour on public works has been continued with very satisfactory results at the heavy excavations near the head of the Sirhind Canal, under the joint direction of the Canal Officers and the Superintendent of the Rúpar Jail. Elsewhere prisoners are employed in smaller numbers, chiefly on the buildings and other works belonging to the Jails.

37. The experiments which have been made for some time past, under an Officer of the Military Works Branch stationed at Meean Meer, on the construction of earthenware pipes for conveyance of water, have been of interest to the Local Government in connection with the prospective requirements of the water-supply works for towns in the Punjab. In this Province where, on account of the distance from the coast, the price of imported iron is high, and native iron has not yet been worked on a large scale for the supply of wants of this kind, the successful manufacture of earthenware pipes for water-works is a matter of much importance. The immediate purpose of the pipes now being made at Lahore for the Military Works is the distribution of the new water-supply in the Cantonment of Meean Meer. The machine was set up and worked in the Lahore Central Jail. The results of the trials, with a much greater head of water than the pipes would be subjected to in the Meean Meer works, were on the whole satisfactory. A copy of the correspondence containing a full and interesting account of the trials has been furnished to the Local Government by the Superintending Engineer of the 8th Circle of Military Works. A large quantity of earthenware pipes for permanent heads of water-courses has been made during the past year by the Irrigation Officers on the Western Jamna Canal (para. 379).

38. The review of the cost of completed works compared with the amounts of the estimates shows that of ninety-four miscellaneous *Major Works* (above Rs. 2,500 each) executed in the General Branch, (that is, not including Railways and Irrigation), completed in 1873-74 and the preceding year,\* the aggregate estimated cost was Rs. 13,94,538, and the actual cost Rs. 14,10,714. Thirty-one exceeded their estimates, and sixty-three were completed within the estimated cost. The total amount of the excesses on the thirty-one was Rs. 48,593; the total savings on the sixty-three, Rs. 32,417, leaving an excess of Rs. 16,176 on the ninety-four works, estimated at Rs. 13,94,538. In some

\* The comparison was not given in the Report for 1872-73.

cases excesses are in reality additions, which ought to have been included originally, as, for instance, the erection of an enclosure wall and gates for a building, clearing and levelling the ground, &c. But this is not the place to discuss further this question of excesses over estimates, on which so much has lately been said. The figures given above are open to correction, after adjustment by the Accounts Office of the details. The general result is approximately correct, and in the Lieutenant Governor's opinion satisfactory.

39. The works of public utility constructed at the expense of private individuals during the past year have been of the usual character, chiefly tanks, wells, and places of accommodation for travellers. Some inconvenience has been occasioned in certain instances by the neglect on the part of the builders of saráis, or of their heirs, to maintain the works in proper condition for fulfilling their purpose. Steps are being taken to remedy the inconvenience to the travelling public, and to provide for the proper management of these buildings.

40. Small sums continue to be annually expended in the conservation of old buildings of architectural value or historical interest.

41. The explorations of the remains of Buddhist buildings in Yúsafzai were continued last year ; the place selected, in communication with the Director General of the Archæological Survey of India, General Cunningham, being Harkai, about 22 miles north of Murdan. The report of the Officer Commanding the Sappers, by whom the work was done, was published in the *Punjab Gazette* Supplement of 11th June 1874. The report of the explorations, made in 1871, of part of the extensive ruins of Takht-i-Bahi, about eight miles north-west of Murdan, which was not published at the time, has since been printed, like the others, in the Supplement to the *Punjab Gazette* of 6th August 1874. His Excellency the Commander-in-Chief has again agreed to let the services of a Company of Sappers be placed at the disposal of the Punjab Government for similar employment next cold season.

42. Several Officers and Subordinates from each Branch of the Public Works Establishment in this Province were transferred to Bengal, towards the end of last year, for employment on the Famine Works.

R. MACLAGAN, MAJOR-GENERAL,

*Secretary to Government Punjab,*

*Public Works Department.*

*Dated 29th September 1874.*

PROGRESS REPORT  
OF  
PUBLIC WORKS IN PUNJAB,  
FOR THE YEAR 1873-74.

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PART I.—IMPERIAL.

Military.

As in 1872-73, the Military Stations which remained under the Provincial Government were those of the Punjab Frontier Force, and the Cantonments of Jhelum and Tallagang.

MILITARY.  
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2. The extension of the Gurkha Lines at *Abbottabad*. Abbottabad.  
was completed. Cell accommodation was provided at this station for two Native Infantry Regiments.

3. Quarters were built for two Staff Havildárs of the Huzara Mountain Train Battery, and verandah supplied to the gunners' quarters. A house at *Abbottabad* was purchased for the Office of the Assistant Adjutant General Punjab Frontier Force, and put into repair. Ground has been taken up for a new Rifle-Range.

4. Repairs to some extent were executed to the Native Infantry Lines at *Abbottabad*; and to the buildings and Fort at *Haripur*.

5. Arrangements had been made for the extension of the water-supply at *Kohat* to the new Cavalry Lines, and the iron syphon pipes required for the work had been received. Kohat.

6. A new roof for the Station hospital at *Kohat* was commenced.

7. Verandahs for the Cavalry Lines at *Kohat* have been built by the Regiment. The new hospital for Native Cavalry was finished, with the necessary subsidiary buildings. Quarters were provided for families of the two Native Infantry Regiments at *Kohat*. Needful repairs of the *Kohat* Fort were carried out, and the plastering of the Military buildings renewed.

8. The subsidiary buildings in the Artillery Lines were re-constructed.

9. The construction of the new Fortified Post at *Bannoo*. Bannoo.  
*Barganattá* was about three-fourths finished. The enclosure wall, and the first storey of the towers and barracks, were finished, and the latter were occupied.

10. A detached ward was built for the Cavalry hospital at *Edwardesabad*.

## MILITARY.

## Bunnoo.

11. Of the new double Rifle-Range at *Edwardesabad*, the outer or right range was finished and levelled. The left was completed with firing platforms as a temporary arrangement.

12. The wells for supply of water to the Cavalry and Artillery at *Edwardesabad* were half completed; the re-construction of the Native Artillery Lines was in progress, and approaching completion; and two magazines and two store-rooms for Native Infantry were finished.

## Derajat.

13. A half-company barrack was commenced for the Native Infantry Detachment at *Rajunpore*.

14. Measures have been for some time in progress for the improvement of water-supply at the *Sabzil-ka-Kót* Outpost by means of an Artesian boring. The boring was carried to a depth of 415 feet, and had to be suspended awaiting the receipt of new tubing and some other apparatus.

15. The roofs of the buildings in the Left Native Infantry Lines at *Dera Ghazi Khan*, which were in need of extensive repair, were renewed.

16. At *Dera Ismael Khan* a defensive enclosure wall was constructed round the buildings of the British Infantry Detachment and Commissariat Department situated immediately outside the Fort of Akalpurh.

17. Preparations were made for some additions to the spurs on the Indus for the protection of the Cantonment of *Dera Ismael Khan*.

18. The repairs of the Frontier posts and rest-houses have been carried out, as before, by the Officers of the Frontier Force.

## Jhelum.

19. An Armourer's shop was built for each of the two Native Infantry Regiments at *Jhelum*, and a Rifle-Range was also provided.

## Tallagang.

20. New arm-racks were put up in the bells-of-arms at *Tallagang*.

## Civil Buildings.

## CIVIL BUILDINGS.

## POST OFFICES.

## Dugshai and Subathoo.

21. The new Post Offices at *Dugshai* and *Subathoo* were completed. Materials were collected for a Bullock Train Godown at *Kussowlie*, but the work was stopped by desire of the Post Master General.

## Kussowlie.

## Umballa.

22. The Post Office, commenced at Sirhind, in the *Umballa* District, was nearly completed.

## Kangra.

23. The Post Office at *Nirpur* was transferred to the Fort, in a portion of which accommodation was provided by alteration of an old barrack.

## BUILDINGS.

24. Some additions were made to the Post Office at *Jullundur*. Jullundur.
25. A Post Office was constructed at *Gurdáspur*, and Gurdáspur.  
another at *Patháńkot*.
26. The Post Master's house at *Lahore* was re-roofed, Lahore.  
and the walls raised.
27. The Bullock Train buildings at *Rawul Pindée* were Rawul Pindée.  
enlarged.

## TELEGRAPH.

28. Some improvements were carried out on the Simla.  
Telegraph Office at *Simla*.
29. A Telegraph Office was commenced during the Dera Ghazi Khan.  
year at *Dera Ghazi Khan*. The main and verandah walls of  
the building were carried up to level of verandah roof, and  
good progress was made with the construction of the out-  
offices.

## PART II.—PROVINCIAL.

## Civil Buildings.

## LAND REVENUE.

## BUILDINGS.

30. A verandah was added to the Deputy Commis- Hissár.  
sioner's English Office at *Hissár*.
31. A shed for suitors was built at the *Sirsa* District Sirsa.  
court-house; and a masonry water-course and reservoir for  
drinking water were constructed.
32. The European Officers' quarters in the Tahsil towns Ludiánah.  
at *Jagrón* and *Samrála*, in *Ludiánah* District, were improved.
33. The new Tahsil at *Dera*, in the *Kangra* District, Kangra.  
work on which was resumed in the previous year, was nearly  
completed. The building is constructed throughout of grey  
sand-stone, with a flat slate roof. The superstructure and  
roofing were completed, and the building was nearly ready  
for occupation at the end of the year.
34. A verandah was added to the east end of the Umritsur  
Commissioner's Kacheri at *Umritsur*. Progress was made  
with the collection of materials for, and the foundations of,  
the new Kacheri for Deputy Commissioner.

## BUILDINGS.

Lahore.

35. The out-offices and other subsidiary buildings, and an ornamental enclosure wall, were constructed for the new Kacheri for Deputy Commissioner at *Lahore*.

36. An office-room for the Superintendent was added to the Abkári building at *Lahore*.

Gujránwálah.

37. Materials were collected for the new Tahsils required at *Gujránwálah* and *Waztrábád*.

Mooltan.

38. The timbering of roof of the Deputy Commissioner's Kacheri at *Mooltan* was renewed, and the lock-up put into proper repair.

Rawul Pindee.

39. Certain additions to the Commissioner's Kacheri at *Rawul Pindee* were completed.

Abbottabad.

40. The new Treasury and Record-room at *Abbottabad*, a masonry building with concrete vaulted roof, was finished. The treasure-chests in the building have, in accordance with a proposal by the Deputy Commissioner, been made in the form of shallow almirahs, placed back-to-back, to allow of each bag being seen and taken out separately without disturbing others.

Bunnoo.

41. The well in the compound of Deputy Commissioner's Kacheri at *Edwardesabad* was in progress. The sinking has been a work of some difficulty, through compact boulders, and water which could not be kept down.

42. Four court-houses were constructed for the Superintendents of Settlement at the head-quarters of each Tahsil in the *Bunnoo* District.

Dera Ghazi Khan.

43. Additions were made to Tahsil buildings at *Rajunpore* and *Dera Ghazi Khan*.

## SALT.

Salt Range, Jhelum District.

44. Some further protective measures were carried out this year to the Khewra gorge, in the *Salt Range*, for the preservation of the adjoining road and buildings. And the aqueduct for carrying sweet water for the workmen at the Mayo Mines was renewed. The protective spur at the *Surdi* gorge was also repaired and lengthened.

## JAILS.

Delhi.

45. The new blocks of solitary cells in Jail at *Delhi* were completed.

Gurgáon, Gujránwálah, Gujráat and Sháhpur.

46. Wards for Civil prisoners were constructed at the *Gurgáon*, *Gujránwálah*, *Gujráat* and *Sháhpur* Jails.

Karnál.

47. The construction of a block of 10 solitary cells for the Jail at *Karnál* was commenced, and the foundations and plinth completed.

## BUILDINGS.

48. Quarters were constructed for the Native Doctor at the *Sirsa* Jail. Sirsa.
49. The construction of a set of 44 solitary cells for the Jail at *Umballa* was completed. An enclosure wall for these cells was also built. Umballa.
50. A new well was provided for the Jail at *Jullundur*. Jullundur.
51. Progress was made during the year with the buildings for the Jail guards, the barracks for prisoners, the subsidiary buildings and the enclosure wall, for the new Jail at *Umritsur*. One barrack has been completed, the foundations of three others put in, and the square enclosure wall has been finished. Umritsur.
52. The roofs of the Printing-room and of the Hawálát, &c., in *Gurdáspur* Jail, were renewed. The additional cells begun in the previous year were completed. Gurdáspur.
53. The new iron railings round the hospital in the *Lahore* Central Jail were completed. Materials were collected for a new store-room, but work was deferred owing to a proposal for a new arrangement. Some special repairs were executed to the Jail buildings. Lahore.
54. The work of converting the "Gola Sarái" at *Lahore* into a District Jail, capable of accommodating 585 prisoners, made good progress. The buildings were more than half completed.
55. Progress was also made with the new Female Penitentiary at *Lahore*. The building was three-fourths completed. It will contain accommodation for 4 European and 270 Native female prisoners.
56. Additional solitary cells were provided for the Jail at *Gujránwálah*. The cloth and manufactory sheds in the Jail were re-built. Gujránwálah.
57. Of 20 solitary cells to be constructed in the Jail at *Gujránwálah*, 10 were completed.
58. In the Jail at *Ferozepore*, 22 new latrines, and a new bathing tank, were constructed. Ferozepore.
59. The new Jail at *Montgomery*, accommodating about 700 prisoners, was completed. Pacca reservoirs and partition walls for the paper-manufactory were also provided. Montgomery.
60. The solitary cells in the *Jhang* Jail were completed. Jhang.

## BUILDINGS.

Mooltan.

61. Iron gratings were provided for some of the buildings of the Jail at *Mooltan*. The work of opening out the beams and trusses of the Jail buildings was completed. Wards were constructed for debtors, and for sessions prisoners, with an enclosure wall. The old lock-up was converted into solitary cells, and wards for European prisoners were also provided. A bathing platform for the use of the prisoners was in progress.

## Dera Ghazi Khan.

62. The work on the new Jail at *Dera Ghazi Khan*, containing accommodation for 306 prisoners, was finished; a gateway was added; and racks were made up for convicts' clothing.

## Dera Ismael Khan.

63. The improvement and re-roofing of some of the buildings in the Jail at *Dera Ismael Khan* was in progress. The work consists of raising the walls, and putting a new roof on two ranges of barracks and two ranges of solitary cells. One compartment in the barracks and one range of solitary cells were completed.

## Rawul Pindee.

64. A set of 50 quarantine cells was constructed for the Jail at *Rawul Pindee*. A shed for carpet machinery was also built.

## Sháhpur.

65. An office for the Jail Superintendent was built at *Sháhpur*, and the paper-manufactory was enlarged.

## Peshawur.

66. The new lock-up at *Peshawur*, in front of the Jail, was finished.

67. A shed, capable of accommodating 18 patients, was constructed for prisoners suffering from infectious fever, in the *Peshawur* Jail.

## POLICE.

## Delhi.

68. A first-class Police Station was constructed during the year at Sonapat, in the *Delhi* District. A Police Station at Mehrauli, in the same District, was commenced and nearly finished. A rest-house for Police Officers at Nanglowi, *Delhi* District, was also constructed.

## Rohtak.

69. The construction of a first-class Police Station at Salawas, in the *Rohtak* District, was commenced and nearly completed. This work has been executed by the Deputy Commissioner of Rohtak.

70. A first-class Police Station was in progress at Salawas, in the *Rohtak* District.

## Sirsa.

71. A Police quarter-guard and stables for mounted police were constructed at *Sirsa*.



## BUILDINGS.

72. Police Stations were in progress at Biláspur and Umballa. at Morindah, in the *Umballa* District.
73. A set of quarters for Police Officers at *Umballa* was built during the year.
74. The extension of accommodation for the Police at Simla. *Simla* was brought to completion.
75. The verandahs of the Police barracks at *Ludiánah* were re-constructed. *Ludiánah*.
76. A first-class Police Station at *Kangra* was commenced, and the work carried up to level of wall-plates. Slates for roofing, and the requisite timbering, were prepared. Materials were also collected for Police Stations at Pálampur and Hamírpur, in the *Kangra* District. *Kangra*.
77. Materials were collected for a second-class Police Station at Dera, *Kangra* District.
78. The Police barracks at *Jullundur* were re-roofed. Quarters were constructed for a Police Inspector, and for two Deputy Inspectors. A first-class Police Station at Nakodar, in the *Jullundur* District, was in progress. *Jullundur*.
79. The accommodation for the town police of Dhurm-salla, in the *Kangra* District, was completed; a municipal Police post was constructed at *Lahore*, and one at *Patti*; a Police Station was built at *Rawul Pindee*, near the Taliánwálah tank, on the road to *Murree*; and two Police Stations were built in the town of *Gujrát*. *Kangra, Lahore, Rawul Pindee and Gujrát.*
80. A Police rest-house was built at Bhyrowál, in the *Umritsur* District. *Umritsur*.
81. Three Police patrolling posts were constructed in the *Gurdáspur* District. *Gurdáspur*.
82. A first-class Police Station was constructed at Nárowál, in the *Sealkote* District. The Police sheds outside the Jail at *Sealkote* were re-roofed. *Sealkote*.
83. Additions were in progress to the Police Station at Phuklián, in the *Sealkote* District.
84. The first-class Police Stations at Shekopura and Khángah Dográn, in the *Gujránwálah* District, commenced in the previous year, and another at Mungtáwálah, in the same District, commenced during the year, were completed. A Police rest-house at *Mutehki*, and three small outposts in the *Gujránwálah* District, were also constructed. *Gujránwálah*.
85. At *Lahore* the bungalow and out-offices for a married European Inspector of Police were completed. *Lahore*.

## BUILDINGS.

- Montgomery. 86. A second-class Police Station and a Police rest-house were in progress at Hujrah, and a Police outpost at Jamlera, in the *Montgomery* District.
- Jhang. 87. A Police Station was built at *Jhang*, and a Police rest-house at *Garh Maháráj* was nearly complete.
- Mooltan. 88. A commencement was made with a first-class Police Station at *Mailsi*, in the Mooltan District.
- Dera Ghazi Khan. 89. A Police hospital at *Dera Ghazi Khan* was commenced, and stopped for consideration of proposals regarding a change of site.
- Dera Ismael Khan. 90. The Police Station at Paniala, in the *Dera Ismael Khan* District, was completed.
- Rawul Pindee. 91. Four second-class Police outposts were built in the *Rawul Pindee* District, and additions were made to the head-quarters' Police Station; and a Police rest-house was in progress at *Bagam*.
- Gujrát. 92. The first-class Police Station at *Gujrát* was completed.
- Jhelum. 93. Materials were collected for a first-class Police outpost at Ahmadábád, in the *Jhelum* District.
- Sháhpur. 94. A Police Office was constructed at *Sháhpur*, and a first-class Police outpost at *Mitta Lak*.
- Tallagang. 95. A Police Station at Tallagang, in the *Jhelum* District, was commenced, and was about one-third completed.
- Abbottabad. 96. A Police hospital at *Abbottabad*, for which materials were collected in the previous year, was brought to completion; and additions were made to the lock-up.
97. A first-class Police Station at *Amin-ki-garhi* was two-thirds finished. Another at *Mianwali* was commenced, but work was suspended, as the River Indus threatened an inroad on the station and the site of the proposed *Thánah*.
- Peshawur. 98. The foundations of a first-class Police Station at Nowshera, in the *Peshawur* District, commenced this year, were finished, and the wood-work of the building prepared. A first-class Police Station was constructed at *Katlang*; and at the head-quarters (*Peshawur*) a new Police hospital was erected.
- Kohat. 99. The first-class Police Station at Hangu, in the *Kohat* District, was completed.

## BUILDINGS.

100. In the *Bunnoo* District, a Police hospital and subsidiary buildings at Edwardesabad were nearly completed. Bunnoo.

101. Police posts were built at Bergi and Ghazni Kheyl, in the *Bunnoo* District.

## EDUCATIONAL.

102. The additions and alterations to the College buildings at *Delhi* were completed. Delhi.

103. Four boarding houses for scholars were in progress in the *Gurgáon* District. Gurgáon.

104. A new school was built at Bádli, in the *Rohtak* District, and three others in other parts of the District were in progress. Rohtak.

105. A school was in progress at Chautála, in the *Sirsa* District. Sirsa.

106. Twenty covered tanks for water, to be used in case of fire, situated near the principal buildings of the Lawrence Asylum at *Sunawur*, were completed. Sunawur.

107. With a view to further arrangements for increasing the supply of drinking water for the Asylum, a tank, capable of holding 4000 cubic feet, was built near the girls' school, to obtain data for determining the quantity of rain-water obtainable from the shingle roofs.

108. Two blocks of servants' houses were added to the out-offices for the boys' barracks. A porch was added to the head-quarters, and a heavy retaining wall, partially undermined, was protected by a masonry footing. The hill-side to the south, below the girls' school, was neatly laid out, and by lowering the site to the north a small play-ground was added. A verandah was also added to the infectious wards of the girls' hospital.

109. A number of minor works were executed for the Lawrence Asylum.

110. The roof of the *Simla* Zilah school was raised, and new windows added to improve the accommodation in the upper storey. Simla.

111. Materials were collected for a school-house at *Ludiánah*, and the concrete foundations of the building were laid in. Ludiánah.

112. Six small lodging houses were constructed at middle schools in the *Ludiánah* District.

113. The work of re-roofing the Zilah school at Núr-pur, in the *Kangra* District, with slates and deodár trusses, was completed, and the building made over to the Educational Department. Kangra.

## BUILDINGS.

Jullundur.

114. Boarding houses were erected, partly from Provincial and partly from Municipal Funds, at Ráhon, Phillour and Nakodar, in the *Jullundur* District. The *Nawáshahr* school was being re-roofed.

## Hoshiárpur.

115. A house was built for the Head Master of the Zilah school at *Hoshiárpur*.

116. Five village school-houses were built in the *Hoshiárpur* District. A branch school was built at *Khánpur*, partly from Provincial and partly from Municipal Funds.

## Umritsur.

117. Four village schools were built, and three were in progress, in the *Umritsur* District.

## Gurdáspur.

118. Additions and alterations to the Zilah school at *Gurdáspur* were in progress. The superstructure of the new work was raised to a height of 12 feet, and the manufacture of bricks and preparation of timber were in progress.

119. Three town schools were enlarged in the *Gurdáspur* District.

## Sealkote.

120. Two boarding houses were constructed at the Jámki and Zaffarwál middle schools in the *Sealkote* District.

## Lahore.

121. Materials were collected in large quantities for the new College and Normal School at *Lahore*, and the superstructure was built up to about 3 feet above level of floor, and the door-frames in the lower floor put up. Owing to the nature of the soil at the site, the foundations of the buildings have had to be carried down to a great depth.

122. Temporary accommodation was provided, in hired buildings, for the *Lahore* Medical School, the old barrack formerly occupied by this school having been removed to make way for the Lahore College.

123. A school was built at Sháhdarah, in the *Lahore* District.

## Montgomery.

124. The *Pákpattan* school was enlarged, and a new school was built at Sháhníwáz, in the *Montgomery* District.

## Jhang.

125. The walls of the new school between *Jhang* and *Maghiánah* were well advanced ; and a school was built at *Ahmadpur*.

## Jhelum.

126. Alterations and additions were made to the *Jhelum* Zilah school.

## Rawul Pindee.

127. Four new schools were built, and materials for three others were collected, in the *Rawul Pindee* District.

## Huzara.

128. Eight new village schools were in progress in the *Huzara* District.

## BUILDINGS.

129. A school was built at Marghaz, in the *Peshawur* District. Peshawur.

130. Five village schools were constructed in the *Dera Ghazi Khan* District ; and a well in the compound of the *Bajunpore* school. Dera Ghazi Khan.

## GENERAL.

131. A ward for female patients was in progress at the *Gurgáon* dispensary. Gurgáon.

132. Enclosure walls were made round graves of European Officers and Soldiers who died in the old Cantonment at Bharawas, in the *Gurgáon* District.

133. Cattle-pounds were constructed in the *Hissár*, *Umballa* and *Gurdáspur* Districts. Hissár.  
Umballa.  
Gurdáspur.

134. A new dispensary was built at Jhajjar, in the *Rohtak* District. Rohtak.

135. A new dispensary and hospital were built at *Jagráon*, in the *Ludiánah* District, partly from District and Municipal Funds and partly from private subscriptions. Ludiánah.

136. The burial grounds at Nári and Garkhel, situated near the *Kussowlie* Cholera Camp of 1872, were enclosed by a cactus fence with gateways. Kussowlie.

137. The floor of the Church at *Simla* was renewed ; and a porch was added. Simla.

138. Ground was taken up for a new cemetery at *Subathoo*. Subathoo.

139. The flooring of the new tower of *Dhurmsalla* Church was completed ; the new chancel, commenced in the previous year, was finished ; and the alterations and additions to the main building nearly completed. These last comprise a new vestry ; the insertion of two new windows to receive stained glass, the gift of the congregation ; a stone cornice in the nave and ornamental filling of the trusses ; and the re-construction of the north and south doorways lower down the nave. A bell was supplied, and new furniture was made. A new jampán-shed was commenced. Dhurmsalla.

140. Out-offices were supplied to the dispensary at *Dhurmsalla*.

141. The wall of the old cemetery at *Núrpur* was repaired, and the ground put into order. Núrpur.

## BUILDINGS.

*Hoshiárpur.*

142. To supply additional accommodation for the Civil Courts and for the records at *Hoshiárpur*, the *Kacheri* is being altered ; the former Small Cause Court is being converted into additional court-rooms for the Deputy Commissioner and his Assistants ; a new Small Cause Court will be erected.

143. Out-offices were built for the *Bharwain* circuit-house, in the *Hoshiárpur* District.

*Jullundur.*

144. A new court-room was constructed at *Jullundur* for the accommodation of the Additional Commissioner.

145. The old *Bádsháhi Sarái* at *Dakhni*, in the *Jullundur* District, which is used as a leper asylum, was partially renewed.

146. The Extra Assistant Commissioner's court-house at *Phillour*, in the *Jullundur* District, was re-roofed.

*Phillour.*

147. Certain additions and alterations were executed to the charitable dispensary at *Phillour*.

*Umritsur.*

148. A bath, an hospital, and quarters for a resident Medical Officer, were in progress at the *Tarn Taran* leper asylum, in the *Umritsur* District.

*Gurdáspur.*

149. Extensive improvements were made to the *Gurdáspur* dispensary, and separate quarters provided for in-patients with families. A new dispensary was erected at *Shakargarh*.

*Dalhousie.*

150. During the year under review the construction of the new Church at *Dalhousie*, which had been under the supervision of the local Executive Engineer of the Military Works Branch, was transferred to the *Gurdáspur* Provincial Division. The walls had been built up to level of window sills. Owing to the difficulty of procuring a sufficient quantity of the slate slabs with which the superstructure was meant to have been built, sand-stone with backing of gneiss has been substituted.

*Sealkote.*

151. The rest-houses for Civil Officers on tour at *Phuklián*, in the *Sealkote* District, and at *Chiniot* and *Shorkót*, in the *Jhang* District, were completed.

*Jhang.*

152. An enclosure wall and ornamental railing, on two sides of the *Jhang* Church compound, were nearly completed.

*Gujránwálah.*

153. A verandah was added to the sessions house at *Gujránwálah*.

154. Poor-houses were constructed at *Hoshiárpur* and at *Sodhra*, in the *Gujránwálah* District.

155. The *Nowshera* dispensary in the *Gujránwálah* District was completed ; a dead-house and four rooms for in-patients were added to the *Gujránwálah* dispensary ; and a room and a verandah to the *Wazrábád* dispensary.

## BUILDINGS.

156. The new out-offices for Government House at *Lahore*, and the improvement of drainage of the compound, were completed. *Lahore.*
157. Improvements were made to the old native building at *Lahore*, known as the "Sháh Chirágh," and occupied by the Office of the Accountant General Punjab.
158. The outer verandah of the Government Secretariat building at *Lahore* was re-roofed.
159. The east wall of the *Lahore* Lunatic Asylum was re-built.
160. Dispensaries were built at *Dipálpur* and *Kamália*, in the *Montgomery* District. *Montgomery.*
161. New dispensaries were constructed at *Ahmadpur* and *Kot I'sá Sháh*, and out-offices were supplied to the dispensaries at *Maghiánah* and *Chiniot*, in the *Jhang* District. *Jhang.*
162. A branch dispensary was built at *Gujrát*, at a short distance from the town, on the road to *Jalálpur*. *Gujrát.*
163. The new sessions house at *Jhelum* was almost completed. *Jhelum.*
164. The new dispensary at *Pind Dádan Khán*, in the *Jhelum* District, was completed.
165. Wards for females were added to the *Sháhpur* dispensary. *Sháhpur.*
166. The dispensary buildings at *Pindi Gheb*, in the *Rawul Pindee* District, were completed with accommodation for the Native Doctor. *Rawul Pindee.*
167. The enlargement of the cemetery at *Murree* was nearly finished, and some further improvements of the cemetery were in progress. *Murree.*
168. A bell was supplied for the Church at *Murree*.
169. New dispensaries were nearly completed at *I'sa Kheyl* and *Kálábágh*, in the *Bunnoo* District. *Bunnoo.*
170. Improvements were made to the dispensaries at *Murdan*, in the *Peshawur* District, at *Dera Ghazi Khan*, and at *Rajunpore*. *Peshawur.*  
*Dera Ghazi Khan.*

## COMMUNICATIONS.

## Communications.

## METALLED ROADS.

Delhi and Mathra  
road.

171. The work of metalling 19 miles of the *Delhi* and *Mathra* road, from the *Okla* Junction to *Kaili*, was in progress. Stone metal was collected for the section from the 11th to 25th mile. The bridges and culverts between *Delhi* and *Kaili* are completed, with exception of the *Buriá* Pul bridge. The earth-work in berms was also in hand.

Delhi to Bahádur-  
garh.

172. The metalling and improvement of the road from *Delhi* to *Baháddurgarh* (to *Rohtak* and *Sirsa*) was finished. The breadth of metalling in the first four miles of the road is being increased; stone and kunkur for this work were collected, and the first mile was nearly completed.

Delhi to Umballa  
and Lahore.

173. The Grand Trunk Road from *Delhi* to *Umballa*, and on through *Umritsur* to *Lahore*, was maintained in fair order. The road was in places much worn by the unusually heavy traffic owing to the grain transport to Bengal. Side drains along the road were provided on the portion passing through the *Umballa* Cantonment.

174. On the section between *Umballa* and *Phillour*, the old metalled crossing over the *Tángri* and *Umla* streams were swept away during the rains. A new metalled crossing was made over the *Tángri*, and that across the *Umla* kept clear of drift sand.

175. In the *Biás* Valley the metalled causeway over the *Akvi* stream was completed.

Umballa to Jagádhri.

176. The road from *Umballa* to *Jagádhri* was maintained in a proper state of repair.

Umballa to Kálka.

177. For the repair of the *Umballa* and *Kálka* road, metal along nine miles was collected, and consolidation completed on  $6\frac{1}{2}$  miles. A flood in the *Jhajra* torrent breached the causeway in two places, which has necessitated its being re-constructed. Materials were collected, and the work commenced.

178. Borings were made in the bed of the *Ghaggar* at *Mobárikpur*, with a view to the project for the masonry bridge.

Ludiánah to Feroze-  
pore and Lahore.

179. The road from *Ludiánah* to *Ferozepore* and thence to *Lahore* was kept in a fair state of repair, and the maintenance of the plantations along it attended to. Up to the end of November the section between *Ludiánah* and *Ferozepore* was maintained in good order. Subsequently, however, the unusually heavy grain traffic wore away the road in many places, and special repairs to these were in progress. On the section between *Ferozepore* and *Lahore*, that portion leading past the *Lahore* City and Railway Station to *Mean Meer* was re-metalled.



## COMMUNICATIONS.

180. The usual repairs were executed to the road from *Jullundur* to *Hoshiarpur*, and the plantations of trees along it maintained. Jullundur to Hoshiarpur.
181. The metalled road from *Umritsur* to *Pathankót* was also kept in good repair. Umritsur to Pathankót.
182. The metalling of the road from *Mooltan* to *Shere Sháh* ferry on the *Chináb* was completed. Mooltan to Shere Sháh.
183. The Grand Trunk Road from *Lahore*, as far as *Jhelum*, continued under the charge of the Officers of the Punjab Northern Railway. Lahore to Peshawur.
184. On the section between *Jhelum* and *Rawul Pindee*, 68 miles, the usual repairs were executed. On 42 miles metal was collected and broken for a new layer, and on 29 miles the metal was consolidated.
185. Between *Rawul Pindee* and *Attok* the protective railings at steep and dangerous parts of the road, commenced in the previous year, continued in progress, and were one-third finished. Between *Attok* and *Peshawur* the new first layer of stone metal along the whole length of the road was consolidated, and nearly 10 miles of a second coat completed, materials being collected for the remainder.
186. A considerable extent of protective walling on the road from *Rawul Pindee* to *Murree* was executed during the year, and 15 small permanent bridges substituted for the old temporary ones. The road was metalled with sand-stone for the length of  $23\frac{1}{2}$  miles from the plains to *Murree*. Rawul Pindee to Murree.
187. The stone causeway across the *Bangrál nallah*, which had been much disturbed by floods, was re-laid.
188. The metalling of part of the *Kohat* and *Bunnoo* Road was in progress. Stone was collected and broken, one mile consolidated, and half the earth-work completed. Kohat District.

## UNMETALLED ROADS.

189. On the cart road from *Kálka* to *Simla*, six masonry culverts were constructed with foundations 30 feet and 40 feet in depth below the surface of the road, and several minor culverts were improved. Retaining walls to a length of about quarter of a mile were built during the year. Twenty drains were improved, and five new ones completed, the aggregate waterway being 80 feet. The improved drains have acted well, none being choked. In some, however, the great slope has led to cutting of deep gorges, rendering necessary the construction of protecting walls. The catch-water drains made above the road have acted well, preventing many slips. Much damage was sustained by the road, at the 44th mile, Kálka to Simla.

## COMMUNICATIONS.

Kálka to Simla.

owing to a heavy local fall of rain in July. Damage was also occasioned in the 50th and 51st miles by heavy rain. There were during the year two closures of the road for short intervals. One caused by failure of a retaining wall, which was soon re-built; and the other by a large slip of rock at the *Tára Devi* cliffs. Several parts of the road were metalled.

190. The new inspection bungalow at Dharmpur, on the road from *Kálka* to *Simla*, was nearly completed.

191. The old road, *viâ Kussowlie to Simla*, was also kept in fair order, with the exception of a short length where the *Kotháir* stream crosses the road.

192. The branch roads to *Dugshai*, *Kussowlie* and *Subathoo* were maintained in repair.

Hindustán and Tibet Road.

193. Of the *Hindustán and Tibet Road* a portion of the old line, between the 4th and 9th miles, was abandoned on account of its excessive gradients and unnecessary rises and falls, and a new line,  $3\frac{3}{4}$  miles in length, substituted. Some of this work was executed by a Detachment of the 32nd Pioneers. Two miles of the old road beyond *Fágu* were also abandoned, and a new line made with moderate gradients.

194. The 2nd, 3rd and 4th miles of the road, which lead also to *Mashobra*, a much frequented resort of the people of *Simla*, were widened and improved; the cutting was done by the working party of the Pioneers. All that remained to be done was one culvert and a few parapet walls, the work having been suspended on account of snow.

195. A portion of the branch lines of the road from *Bági* to *Sidhpur* was re-opened. The timber bridges required renewal. The Executive Engineer has noticed that several beams of *Picea Webbiana* put down more than ten years ago were found to be perfectly sound, and were used in the re-construction of some of the bridges.

196. This higher branch road (originally intended to be the main line of cart-road) was given up in 1865, as it was considered more important to take the road by the valley of *Satlaj* and through *Rámpur*.

197. The *Wángtu* gallery, running for more than 300 feet along the face of a perpendicular granite cliff overhanging the *Satlaj*, was strengthened by intermediate cradles or points of support, reducing the spans of many of the bays from 30 feet to 12 feet.

198. The road was kept in repair as far as *Pángi*, the present terminus.

Kangra Valley Road.

199. The section of the *Kangra Valley Road* from *Pathánkót* to *Núrpur* was nearly completed. Numerous culverts and minor bridges were finished; gradients eased, and side slopes turfed and grassed. To repair serious damage to the road caused by the inroads of the *Jabbar* stream, a heavy revetment wall was constructed, and proved very effective.

## COMMUNICATIONS.

200. Some additional strips of land were taken up for the road during the year. Kangra Valley Road.

201. Between *Núrpur* and *Bandarghát* a considerable quantity of earth-work, some heavy embankments across ravines, and filling to culverts, were executed, and a greater extent of road opened out to wheeled traffic.

202. Stone causeways were constructed across the *Kajjian Grel* and *Bhér* streams, but both these were found to be impassable during the rains, and estimates for bridges at these points are under preparation. The temporary crossing of the *Ladwára* stream was entirely carried away during a flood. Numerous culverts, syphons, and minor bridges, were constructed near *Sháhpur*, and only a few of these now remain to be done to render the section fit for cart traffic as far as the *Chambi* or *Ladwára* river at the junction of the main road between *Kangra* and *Dhurmsalla*. A temporary wire bridge for foot passengers across the *Kauli* stream was commenced.

203. Between *Bandarghát* and *Baijnáth* progress was made with earth-work, and with the construction of minor bridges and culverts.

204. The whole length of the cart-road from *Pathánkót* to *Pálampur* was kept in repair, and no serious damage occurred during the rains. The precipice at the junction of the *Brál* and *Dehri* streams came down and blocked up the road for some hours. Some small culverts were undermined, pointing to the necessity of giving floors to culverts and minor bridges on the line of the *Kangra Valley Road*.

205. Dry masonry parapet walls were provided at precipitous and dangerous portions of the road between *Dhurmsalla* and *Kangra*, particularly on the *Kangra* right incline. Four small timber bridges were renewed and re-opened for traffic. The heavy approaches to the *Chaitru* bridge were nearly completed, and a temporary road diversion made across the *Bánganga* at *Kangra*. Dhurmsalla to Hoshiárpur.

206. The renewal of retaining walls along the *Pathánkót* and *Dalhousie* road was in progress. Surveys were also in hand in connection with proposed improvements and extensions of the road. A small timber bridge on the 3rd mile from *Dalhousie* was carried away by floods, and was re-built. Pathánkót to Dalhousie.

207. The necessary repairs were executed and trees planted along the road from *Sealkote* to *Wazirábád*. Sealkote to Wazirábád.

208. The raising and bridging of the part of the *Lahore* and *Sháhpur* road, from *Shekopura* to the *Chúchak* ferry on the River *Chindáb*, was completed. Groves of trees were planted along the road. Lahore to Sháhpur.

## COMMUNICATIONS.

Mooltan to Dera  
Ghazi Khan.

209. Metal was in course of collection for improvement of the section of the *Mooltan* and *Dera Ghazi Khan* Road from the left bank of the *Chináb* to *Muzaffargarh*. Mud retaining walls were built against the sides of the cuttings through the sand hills along the road.

Dera Ismael Khan  
to Jhang.

210. A survey was made of the proposed line of road from *Dera Ismael Khan* to *Jhang*. From *Bakkar* to *Mankera* the road has been nearly completed.

Dera Ismael Khan  
to Bunnoo.

211. The improvement of three miles of the *Dera Ismael Khan* and *Bunnoo* Road through the *Peyzu* Pass was in hand. About one-third of the length was opened, and the remainder passable as a bridle road.

212. Further progress has been made with the construction (by the Civil Officers) of drain bridges and culverts on the road between *Dera Ghazi Khan* and *Mithankot*.

Kohat District.

213. Several miles of low road in the *Kohat* District were raised, and permanent bridges substituted for temporary bridges and gaps.

Peshawur District.

214. The line of road from *Sháhkót* to *Chapra*, on the way to *Cherát*, was improved;  $1\frac{1}{2}$  miles of the new road were completed.

Huzara District.

215. The *Murree* and *Abbottabad* Road has been widened in certain parts, and additional parapet walls built.

## DISTRICT ROADS.

Karnál District.

216. Materials were collected for metalling the first three miles of the road from the Grand Trunk Road at *Karnál* towards *Jagádhri*. A village track between *Butánah* and *Indri* was raised and widened to the dimensions of a road.

Gurgáon District.

217. A new bridge was built at the junction of the two roads from the Town and Civil Station of *Gurgáon* to *Sohnah*, to carry off drainage from the *Jharsa* bund; a masonry causeway was being constructed where the two roads, after junction, are crossed by the *Bádsháhpur* nallah; seven bridges were in progress between this causeway and *Sohnah*; and kunkur was being collected for metalling four miles of the road. A road was begun from the town of *Farakhnagar* to the Railway Station, half being reserved for light and half for heavy traffic; and a road was in progress from *Farakhnagar* towards *Pataodi*. Bridges were completed on the *Masáni* road; and sign-posts were put up on various roads of the *Gurgáon* District.

Hissár District.

218. Two miles of the main road from *Delhi* to *Sirsa*, between *Hissár* and *Fattehabád*, were metalled, and 17 miles were raised, to be metalled gradually.

## COMMUNICATIONS.

219. Eight miles of road were newly metalled in the *Rohtak* District, whereof five miles are between *Rohtak* and *Hissár*. Some unmetalled district roads were widened and re-made: of these, the principal were the roads from *Rohtak* to *Jhnd*, and from *Jhajjar* to *Bahádurgarh* and *Kharkhaudah*. Several bridges were constructed on district roads, and small bridges were enlarged.

*Rohtak* District.

220. A bridge was widened on the main road from *Sirsa* to *Hissár*.

*Sirsa* District.

221. In the *Umballa* District, the roads from *Koráli* to *Morindah*, and from *Morindah* to the border of *Pattíalah* territory, *en route* to the Sirhind Railway Station, were raised; and bridges were built on the roads from *Abdullahpur* to *Ládwah*, and from *Ládwah* to *Pipli*, and on the roads to the *Barára* Railway Station, to *Rúpar* and *Náhan*. The roads from *Abdullahpur* to *Pihewah* and *Buriah*, and the roads to *Subathoo*, *Jagádhri*, *Náhan* and *Rúpar*, were raised and improved.

*Umballa* District.

222. The roads from *Ludiánah* to *Dehlon* and *Samrála* were metalled. A bridge was constructed over the Buddha nallah (old Satlaj) at *Ludiánah* for the Beyt villagers and their carts to cross at all seasons.

*Ludiánah* District.

223. The metalling of the road from *Jullundur* to *Kapúthallah* was completed. Four miles of the *Jullundur* and *Nakodar* road were raised and metalled, and kunkur was collected for metalling two miles more. The unmetalled road between *Phagwárah*, *Bungah*, *Nawáshahr* and *Ráhon* was raised. A causeway on the *Phillour* and *Ráhon* road, and three bridges, were nearly completed.

*Jullundur* District.

224. About 40 miles of unmetalled road, from *Jaijon* to *U'nah* and *Polián* to *Santokgarh*, from *Tousa* to *Nangal Abiána*, and from *Dasúha* viâ *Tándah* towards *Jullundur*, were constructed in the *Hoshiárpur* District; a masonry bridge was in progress over the *Nangal* nallah on the *Tándah* road; and three bridges were built on other roads of the *Hoshiárpur* District.

*Hoshiárpur* District.

225. The *Kulu* and *Láhoul* road was completed at an easy gradient from *Koksar* at the foot of the *Botang* Pass to *Lingti* on the border of *Ladák*, a total length of 101 miles. At certain points this road reaches an altitude of 16,000 feet above the sea level. The two roads to *Mandi*, viz., from *Gagreit* in the *Hoshiárpur* District through *Kulaba* and *Nadáon* to the *Mandi* border, and from *Mandi* viâ *Barsar* and *Pir Nigáhi* to *U'nah*, were altered and improved. Bridges were constructed over the *Biás*, on the road from *Kulu* to *Plách*; over the *Awah*, on the road from *Pálampur* to *Baijnáth*; over the *Nal*, on the road from *Ránttal* to *Jowálámukhi*; and over the *Manoni*, on the road from *Dhurmsalla* to *Pálampur*.

*Kangra* District.

## COMMUNICATIONS.

## Umritsur District.

226. An unmetalled road, eight miles long, was made between Lopoki and Atári in the *Umritsur* District; and 9 out of 13 miles were completed of a road from *Ajndalah* to *Fattehgarh*. A bridge was in progress on the *Bámdás* and *Ajndalah* road.

## Gurdáspur District.

227. In the *Gurdáspur* District, the raising and bridging of the *Batálah* and *Dera Nának* road were completed, and the raising and bridging of the *Batálah* and *Sri Gobindpur* road were nearly completed. The roads from *Gurdáspur* to *Paniár*, towards *Dindnagar*, and from *Kahnawán* to *Perosháh*, were raised and bridged during the year, and similar improvement of the *Kalánaur* road, connecting several large towns, was taken in hand. A mile of the road from *Nowshera* to *Trimmu* was metalled. The roads from *Batálah* to the Railway at *Wazir Bular*, and from *Gurdáspur* to *Behrámpur*, were bridged in seven places; and 18 bridges and a metalled gap were constructed on other district roads. In all, 55 bridges of sizes were built during the year in this district.

## Sealkote District.

228. Four bridges and two metalled gaps were constructed on the *Bajwát* road *viâ Gondal*, and a bridge and two gaps on the *Bajwát* road *viâ the Khoja Chak* ferry; and *Bajwát* has now been placed in easy communication with *Sealkote*, the head-quarters of the district, all the year round. Gaps were constructed on the *Sealkote* and *Kuluwál* road, a bridge on the road to *Lahore* *viâ Dode*, a gap on the *Sealkote* and *Gurdáspur* road, and a bridge on the road from *Chowindah* to *Charoah*; the road from *Zafarwál* towards *Jammu* was raised; and a new road was opened out between *Dhadaura* and *Panjgráon*,  $7\frac{1}{2}$  miles long, to connect *Reya* and *Kilah Sobha Singh* with the main road to *Umritsur*. Mile-posts were erected along four principal roads.

## Lahore District.

229. The *Kasúr* and *Ráiwind* road, in the *Lahore* District, was partially re-metalled, at the joint expense of Provincial and District Funds. Six bridges were constructed or in progress on the roads to *Hari-ki-Ghát*, and from *Mean Meer* to *Ferozepore* and to the *Lahore* and *Mooltan* road.

## Gujránwálah District.

230. Three bridges were constructed on the *Lahore* and *Kádrabád* road, and the *Gujránwálah* and *Shekopura* road, and four gaps on other roads of the *Gujránwálah* District.

## Montgomery District.

231. Three bridges and 10 culverts were built on roads, in the *Montgomery* District; and sign-boards were being made to be set up at cross roads.

## Jhang District.

232. The roads from *Jhang* to *Chícháwatni*, and towards *Dera Ismael Khan*, were improved.

## COMMUNICATIONS.

233. The road from the *Gujrāt* Post Office to the 72nd mile on the Trunk Road was metalled; and the metalling of the *Jaldipur* and *Kuhwāl* road was completed. The raising and metalling of the road from *Gujrāt* to *Kunjah* were completed, and the gaps and embankments are reported to have answered well. Progress was made in building a submerged bridge at the Buddhi nallah crossing the *Gujrāt* and *Phálián* road; and small bridges and causeways were made on this road, on the road to *Khárianwālah*, and on the road from *Sealkote* to *Jhelum*. The unmetalled road from *Gujrāt* to *Sádullápur* and other district roads were extensively improved.

Gujrāt District.

234. In the *Jhelum* District, alterations and improvements were made to the road from *Dhariálah* to *Chakowál*; and masonry bridges and metalled gaps were constructed on the road from *Jhelum* to *Pind Dádan Khán*.

Jhelum District.

235. The roads from *Sháhpur* to *Khusháb*, and *Rajar* to *Katta*, subject to inundation, were raised.

Sháhpur District.

236. In the *Rawul Pindee* District, 14 bridges were constructed, viz., 10 on the road from the city of *Rawul Pindee* towards *Huzara*, 3 on the road from *Rewát* to *Kallar*, and 1 at *Chakri*, on the road from *Fattehjang* to *Tallagang*. Stone was collected for metalling  $3\frac{1}{2}$  miles of road from *Rawul Pindee* to *Chúhar*, in connection with the new bridge over the *Leh*, at the city of *Rawul Pindee*. Of this bridge, the west pier and wings were completed, and progress was made with the two central piers in the bed of the stream, and the foundation of the fourth, or east pier, was laid.

Rawul Pindee Dist.

237. In *Huzara*, improvements were made to the old road from *Garhi Habibullah* to *Mangal*, for communication with *Kashmír*, and to the road from *Kohála* to *Malán*, for access to the suspension bridge avoiding the ascent to *Bakkot*. A road from *Hartpur* via *Maksúd*, *Langriál* and *Lora*, to open up the *Murree* market to *Hartpur*, was nearly completed.

Huzara District.

238. The *Nisatta* road, from the city of *Peshawur* to the Dobandi ferry, was raised, and bridges on it were repaired; and the roads from *Khána Mári* to *Kotlah*, from *Pirbála* to *Chauki Shajai*, *Badni* to *Charparosa*, *Michni* and *Tangi* to the Nagoman ferry, *Murdan* to *Rustam* and *Akora*, and other roads of the *Peshawur* District, were improved and bridged.

Peshawur District.

239. Fourteen miles of unmetalled road, with a few culverts, were constructed from *Kohat* to *Shekhán*, and to *Sháhpur* and *Bánda*, in the *Kohat* District.

Kohat District.

240. Bridges and culverts were built over large and small water-cuts crossing the roads to *Gumatti* and *Bazár Ahmad Khán*, in the *Bunnoo* District.

Bunnoo District.

## COMMUNICATIONS.

Dera Ghazi Khan  
District.

241. The bridges and culverts on the road from *Dera Ghazi Khan* to *Mithankot* were completed; and 10 miles of the main road from *Dera Ghazi Khan* to *Rajunpore* were raised.

## BRIDGES.

Umballa to Jagádhrí.

242. The approaches to the new bridge over the Western Jamna Canal, on the *Umballa* and *Jagádhrí* Road, were completed.

Delhi to Umballa.

243. The works in the Márkanda River for the protection of the town of Sháhábád and the bridge on the Trunk Road were strengthened and extended.

Hindustán and Tibet  
Road.

244. A new bridge has been built over the Syldang stream in the 112th mile of the Tibet Road, the former bridge having been carried away by a flood. The new bridge has been built with considerably increased span.

245. The *Machára* bridge of 50 feet span, on the 64th mile, was thoroughly repaired, and the planking renewed.

Hoshiárpur to  
Dhurmsalla.

246. The single arch stone bridge over the Mánji stream at *Chaitru*, of 90 feet span, on the road from *Kangra* to *Dhurmsalla*, was nearly completed. The settlement at the crown on striking the centres was 21 of a foot. The backing was carried up to a height of  $9\frac{1}{2}$  feet above skewbacks before the centering was lowered. The work has been finished to roadway level, and the bridge is open for traffic. A temporary wire suspension bridge, 100 feet span, was erected for the convenience of traffic in the rainy season and during the construction of the permanent bridge.

Kangra Valley  
Roads.

247. The following bridges were in progress on the *Kangra Valley Roads*.

248. The *Dehri* bridge at *Kotlah*, of timber, 214 feet span, which has been open for some time, had the superstructure and entrance archway of the right abutment completed. The defence works at the bridge, which had been partially destroyed by floods, were re-constructed, and some additional iron-work in the bridge was completed.

249. The *Neri* bridge, 27 feet span, was finished.

250. The *Brál* bridge, 84 feet span, was finished, and provided with iron railings.

251. The *Seon* bridge, three spans of 25 feet, for which in the previous year materials had been collected, was nearly completed, and was expected soon to be opened for traffic. The completion of this bridge will open out four miles more of the cart-road, or nearly to Sháhpur.

252. The protective work at the *Baner* bridge, of 140 feet span (concreting the undermined portion of the rock on which the left abutment stands), was completed, and stopped any further scouring action of the stream.



## COMMUNICATIONS.

253. The old bridge over the *Bāngāṅā* or *Baner*, situated on the cart-road, below the Kangra Fort, was, on account of its insecurity, demolished, and a temporary crossing made for fair weather. A temporary wire suspension bridge is being put up, and an estimate for a permanent iron Warren-girder bridge has been prepared.

Kangra Valley  
Roads.

254. The *Batho* bridge, on the *Dehra* cart-road, near *Bāni-ki-Tāl*, which had received some damage, was repaired.

255. On the road between *Bāni-ki-Tāl* and *Jawdlāmukhi*, the *Nakti* bridge, five spans of 30 feet, was seriously damaged by floods, the right abutment and one pier being carried away. Arrangements were made for the necessary renewal, which is being done in the present year.

256. A bridge at *Gabri*, over the *Naumāni nadi*, on the road from *Sealkote* to *Gurdāspur*, was in progress. The piers of the bridge were three-fourths finished.

Sealkote to Gurdā-  
pur.

257. Another bridge, over the *Kirān nadi*, on the road from *Dera Nānak*, *Gurdāspur* District, to *Umrītsur*, was in course of construction. It has five spans of 30 feet. The foundations of the piers were half finished.

Gurdāspur to Umrī-  
sur.

258. Materials were collected for a bridge over the *Poti nallah*, on the road from *Dera Ismael Khan* to *Tānk*, *Derajāt* frontier.

Dera Ismael Khan  
to Tānk.

259. The protective measures for the *Ujri* bridge, on the *Rawul Pindee* and *Murree* Road, were finished. The *Sāl-grāon* bridge, of timber, 61 feet span, on the same road, was entirely renewed; new girders of *deodār* being substituted for the old ones of *chil*.

Rawul Pindee to  
Murree.

260. Spurs of sand and fascines were constructed in the *Dīna nallah* to guide the stream above the bridge. A spur of dry stone was also constructed for the protection of east abutment of the *Bakrālla* bridge.

Lahore and Peshawar  
Road.

261. A bridge has been built in place of a former metalled gap on the road between the *Peshawar* Outposts of *Abazai* and *Shabkadar*.

Peshawar.

## BOAT BRIDGES AND FERRIES.

262. The railway bridge over the *Satlaj* at *Phillour* having again been opened for passage of traffic, the boat bridge was given up, the ferry meeting all ordinary requirements of local traffic. Under instructions from the Government of India a boat bridge was again constructed for the passage of troops on the march, country flat bottomed boats being used along with such Government boats as remained; and the bridge was opened with a single roadway.

Trunk Road between  
Umballa and Lu-  
diānah.

## COMMUNICATIONS.

Jullundur.

263. Eight hundred feet in length of planked roadway were laid in the approach to the Wazir Bular ferry, in the *Jullundur* District, and a house was built for the Superintendent on the *Unrissur* side of the river.

Ferozepore.

264. The boat bridge over the Satlaj at *Ferozepore* was completed with double roadway, and was maintained in good order throughout the season. A considerable flood occurred in February 1874, but did no damage.

Shahdara, near  
Lahore.

265. The second roadway and new superstructure of the bridge of boats over the Ravi at *Shahdara* were completed. Some tree-spurs above the bridge were strengthened, and the bridge maintained in good order throughout the year.

Jhang.

266. A bridge of boats was constructed over the main stream of the Chináb at Trimmu, in the *Jhang* District, with a trestle bridge over a branch of the river beyond the main stream; the latter was swept away by a flood after being in use for four months. Two light ferry boats were built for crossing mails, &c., at Trimmu.

Jhelum.

267. Two additional van boats were constructed at *Jhelum*, and new superstructure for the boat bridge to replace articles lost by flood.

Pind Dadan Khan.

268. The construction of nine new boats for the boat bridge over the Jhelum river at *Pind Dadan Khan* was in hand.

Attok to Peshawar.

269. Some additions were made to the Attok boat bridge and the bridge was maintained in good order for the winter season.

Dera Ismael Khan.

270. A bridge of boats has this year been substituted for the ferry over the River Indus at *Dera Ismael Khan*, during the cold season, to meet the increasing demands of the traffic. Twenty new boats of approved pattern were built, and 40 country boats hired, and the superstructure for a length of 2000 feet completed. The bridge was opened for traffic in January 1874.

Dera Ghazi Khan.

271. The metalled approach to the Kuraishi ferry at *Dera Ghazi Khan* was completed up to the ghát or landing.

## ACCOMMODATION FOR TRAVELLERS.

Gurgáon District.

272. A tank was constructed on the *Gurgáon* and *Sohnah* road; a pacca ghát was added to the Kauráli tank at *Tikri*; and several tanks were cleared and deepened in the *Gurgáon* District.

## COMMUNICATIONS.

273. A verandah was added to the Sohna rest-house, in the *Gurgaon* District; and an addition was made to the *Gurgaon* sarái, for the accommodation of Members of the District Committee and others. Gurgaon District.

274. Two roadside wells were built, one at *Karnál*, and the other at *Jinghára*, on the *Karnál* and *Butánah* road; and some tanks were being excavated along the *Karnál* and *Kythal* road, for use, in the first instance, when the road is being metalled.

275. Several roadside wells were excavated in the *Rohtak* District, experimentally, to obtain sweet water; those which answer will be made of masonry in the current year. The *Medína* rest-house was renewed with materials of the abandoned sarái there; and a new range of out-offices was made for the *Rohtak* staging bungalow. Rohtak District.

276. A bund was constructed across a nallah or spill of the Satlaj at Mohársona, in the *Sirsa* District, to supply irrigation to 18 villages; a tank was excavated between Sirsa and Jhorár, on the road to *Fázilke*; masonry inlets were made to tanks at *Jodka* and *Sohúwálah*; and two other tanks were deepened. Sirsa District.

277. The *Sohúwálah* and *Malot* rest-houses, in the *Sirsa* District, were improved; and accommodation for native female travellers was added to the sarái at *Fázilke*.

278. Three tanks were constructed in the *Ludiánah* District, and a well on the *Samrála* and *Khanna* road. Ludiánah.

279. The additions and improvements to the dák bungalow at Núrpur, in the *Kangra* District, commenced in the previous year, were completed, and the bungalow opened for the public. Kangra.

280. A new dák bungalow at *Pathánkót*, in the *Gurdáspur* District, on the road to Dalhousie, was completed. Gurdáspur District.

281. A new supply depôt was in progress at *Batálah*, in the *Gurdáspur* District. Roadside wells were constructed and in progress on the *Shakargarh* and *Zafarwál* road, and at the junction of the roads to *Pathánkót*, *Sujánpur*, *Mádhopur* and *Sháhpur*.

282. A well was built, and another was in progress, at places along the road from Toba Tek Singh, in *Jhang* District, to *Dera Ismael Khan*, and a third was built on an extensive tract of Bár land near *Koh Kerána*. Jhang.

283. Three roadside wells were constructed, and five others were in progress, in places where water is scarce and difficult of access in the *Lahore* District. Lahore District.

## COMMUNICATIONS.

Gujránwálah District.

284. Alterations were made to the supply depôt at Wazírábád, in the *Gujránwálah* District. The room for Europeans, over the gateway of the *Wazírábád* sarái, which had accidentally been burned, was re-built.

Montgomery District.

285. The old staging bungalow at *Chícháwatni*, which was too far from the Railway Station, and from the head of the mail-cart-road to *Jhang*, was given up, and a new one was in progress.

Gujrát District.

286. The sarái at Khárián, in the *Gujrát* District, was re-roofed.

Sháhpur District.

287. New saráis were built at Kund, on the road from *Sháhpur* to *Sakesar*, and at Mitha Tiwána, on the road from *Lahore* to *Dera Ismael Khan*.

Huzara District.

288. The sarái at *Abbottabad*, commenced in the previous year, was completed. This work has been done by the Civil Officers. A new dák bungalow at Changla Gali, on the road from *Abbottabad* to *Murree*, was nearly completed. The building hitherto used as a dák bungalow, being near the huts of the soldiers quartered in this place for the summer, will be made over to the Military Department for the accommodation of troops.

289. The new sarái at *Abbottabad*, in the *Huzara* District, was completed.

Peshawur District.

290. Several wells were improved, and five tanks were excavated, partly for the convenience of travellers, in the *Peshawur* District.

Bunnoo District.

291. A masonry tank was constructed in the *Bunnoo* District, at Sháhbáz Kheyl, on the road to *Dera Ismael Khan*, and one at Titar Kheyl, on the same road, was approaching completion. A well, the water of which has proved good, was sunk between Miánwáli and Wánbhachrán, on the road to *Lahore*. An experimental shaft was being excavated at Begu Kheyl, in the rainless tract of *Marwat*; it had reached a depth of 150 feet without signs of water.

292. Additions were made to the dák bungalow at Naorang, and to the saráis at Peyzu and I'sá Kheyl, in the *Bunnoo* District, on the highways to *Lahore* and *Dera Ismael Khan*.

Dera Ghazi Khan District.

293. Out-offices were added to the Fázilpur and Sadrdín dák bungalows, in the *Dera Ghazi Khan* District. Further progress was made in constructing the well at *Sakhi Sarwar*. The shaft is 210 feet deep, with a masonry cylinder 40 feet deep and 18 feet diameter. Great difficulty was experienced in sinking seven feet below water, owing to the rocky soil and to the coldness of the water. The new sarái at the entrance of the town of *Dera Ghazi Khan* was completed.

## Miscellaneous Public Improvements.

## Mis. Pub. Impts.

294. One-half of a new town-hall at Fírozpur, in the *Gurgáon* District, was constructed ; masonry walls and steps were made to a tank. A metalled road was made from *Revdri* to the Railway Station ; and the circular road at *Revdri*, carried away by floods, was renewed. Houses for the Municipal establishment and latrines were made, and other improvements effected, in various towns.

Gurgáon District.

295. An old channel from the Saraswati to the Bidkedár tank at Kythal, in *Karnál* District, was being cleared and improved ; some new paving was laid down in *Karnál*, and wells at *Kunjpurah* were covered.

Karnál District.

296. New saucer drains were constructed in the towns of *Hissár* and *Hánsi* ; old hollows were filled up and levelled ; 12 tanks were cleared, embanked and improved ; wells were provided with wooden frames ; and new conservancy carts were made up. At *Bhiwáni*, two new masonry wells were built, and iron gates supplied to the gateways.

Hissár District.

297. About  $3\frac{1}{2}$  miles of station road were metalled at *Rohtak*, mounds in the station were levelled, and plots planted with trees, and gateways and gates supplied to the station garden. Streets in the towns of *Jhajjar*, *Beri*, *Bahádurgarh* and *Kharkhauda* were metalled.

Rohtak District.

298. Several village tanks were deepened in the *Rohtak* District.

299. The *Sirsa* public garden was enclosed by a wire fence. A tank for drinking water was partially excavated at *Ellenabad* ; the work was stopped on coming to sandy soil. Gateways and gates were supplied to *Ránia*. The streets, drains and water-supply of *Sirsa* and *Fázilke* were improved.

Sirsa District.

300. A town-hall was constructed at *Rúpar*, in the *Umballa* District ; a latrine was built at *Umballa*, and an enclosure wall to a burial ground ; three bridges were built and three streets paved in *Jagádhri*, and a street was paved in *Thanesar*.

Umballa District.

301. The large sewer at *Ludiánah* was continued, and a garden was made round the town-hall ; drains and streets of *Máchhtwárah* and *Khanna* were improved ; and latrines were constructed at *Bhylolpur*.

Ludiánah District.

302. Some absorbing tanks or pockets for water were cut on the Jacko hill at *Simla* for aiding the water-supply of the station.

Simla District.

## MIS. PUB. IMPRS.

## Simla District.

303. At *Simla*, alterations were made to the Combermere reservoir ; corrugated iron gutters were supplied for drainage of the bazár ; compensation was paid for the removal of houses and for land taken up for improvement of the station ; and retaining walls were built in various places.

## Jullundur District.

304. Materials were being prepared for a project for the internal sewerage of *Jullundur*. Four latrines were built in that town ; streets were paved in the suburban towns of *Basti Sheikh* and *Basti Gazan*, and in *Nakodar*, *Kartárpur*, *Adampur*, and other towns ; and five latrines were built at *Nirmahal* and *Aláwalpur*.

## Hoshiárpur District.

305. Further grants, amounting to above Rs. 6,000, were made from the District Fund of *Hoshiárpur*, in aid of wells and reservoirs in hilly tracts of the District, and for excavating tanks.

306. Metal was substituted for brick paving in the principal streets of *Hoshiárpur*, and a new latrine was built in the town ; the Committee house at *Tándah* was completed ; and streets and drains of other towns were improved.

## Kangrá District.

307. Bazárs of *Kangra* and *Sujánpur* were paved, and reservoirs made and roads improved at *Sultánpur*.

## Umritsur District.

308. Additional ground in the Rámábágh Garden at *Umritsur* was levelled and laid out and planted. The filling of the Alúwália, Bhái Sálo and Kilah Bhangían *Dhábs* or hollows in the city, which had been deferred for want of money, was taken in hand, and was nearly completed. A masonry drain was made for the escape of storm drainage across the Bhái Sálo *Dháb*. Several roads leading through the Kilah Bhangían quarter were raised and levelled, preparatory to being paved. The public latrines of the city were improved, and new sewerage drains were made and old ones improved.

## Gurdáspur District.

309. Heavy floods carried away about 900 feet of the spurs made in the River *Rávi* to protect the shrine and town of *Dera Bába Nának* from the encroachments of the river. The spurs were renewed and maintained for the remainder of the year, and will now be further extended, with additional protective arrangements. The spurs have induced a deposit of silt to a depth of 2 to 3 feet over a considerable area in front of, and above the town, on the left bank of the river.

310. In the *Gurdáspur* District, a town-hall was built at *Dera Nának*, one was in progress at *Narot*, and those at *Sri Gobindpur* and *Sujánpur* were improved. A bathing ghát was made at *Gurdáspur*, and one was in progress at *Sri Gobindpur* ; the circular road at *Batálah* was completed ; new

## MIS. PUB. IMPRS.

gates were supplied to *Kalánaur* and *Dínánagar*; drains and bridges were made at *Batalah* and *Dera Nának*; and the streets, drains and water-supply of other towns were improved, and latrines constructed. At *Dalhousie*, the South Teera Mall was widened and improved, and the water-course was extended to a new cistern at one end of the bazár.

Gurdáspur District.

311. The *Sealkote* station garden was improved; one of the principal streets of the town was drained; and two main bazárs were metalled; and streets were paved in *Kilah Soba Singh* and *Nárowál*.

Sealkote District.

312. The *Gujránwálah* circular road and some principal streets in the town were metalled and drained. The drain leading from *Wastrábád* to the *Palku nallah* was extended, two bathing places were built for women, the garden was enclosed, two main streets were paved, and four latrines built. In the other towns also latrines were built, streets paved, and drainage improved, and a bathing place for women was made at *Pindi Bhattián*.

Gujránwálah District.

313. Two new latrines were being built at *Lahore*; a bathing ghát for women was commenced, some streets leading from the sadr bazár were raised and drained, and the water-course through the bazár was covered with masonry. A town-hall and latrine were nearly completed at *Khemkarn*.

Lahore District.

314. Five masonry wells were built in the *Montgomery* District; a water-course was constructed at *Chappar*, and a bund on the *Nikki Canal* at *Jandraka*; and an old masonry tank at *Gogerah* was restored.

Montgomery District.

315. A drainage cut was made from a branch of the *Chináb*, passing through *Jhang* and *Maghiánah*, and falling into the river again.

Jhang District.

316. At *Gujrát*, alternate lengths of the principal bazár street were metalled and paved, to test the relative advantages; and bathing places for women were constructed. A large open drain was constructed, to drain half the town of *Jalálpur*; the paving of streets of this town was continued; and the circular road was raised and widened, and four bridges built.

Gujrát District.

317. In the *Gujrát* District, grants were made in aid of wells and tanks for villages on the slopes of the *Pabbi* hills, and the high undulating land bordering on *Jammu* territory.

318. The masonry embankment along the river bank at *Jhelum* was continued; streets of the town were metalled; streets of *Pind Dádan Khán* were raised, paved and drained; and streets of *Chakowál* and other towns were paved.

Jhelum District.

319. The tanks at *Domeli* and *Barril*, in the *Jhelum* District, were completed.

## MIS. PUB. IMPTS.

## Sháhpur District.

320. In the towns of the *Sháhpur* District, various sanitary improvements were effected, consisting of the filling of ditches and hollows, draining stagnant water, and otherwise improving the town drainage, and improving the condition of drinking wells. Streets of *Sáhtwál*, *Bherah* and *Khusháb* were paved; the tank at *Miáni* was improved, and a masonry ghát constructed on the *Rántwah* Canal; a cremation ground was formed at *Sháhpur*. Six bridges were constructed over the station canal at *Sháhpur*, for the convenience of the neighbouring villages.

## Rawul Pindee District.

321. An experimental well was commenced in connection with the scheme for improved water-supply of the town of *Rawul Pindee*; it was excavated to a depth of 38 feet, and the boring was then carried down 103 feet. A fire-engine was purchased for the town; the *Sháhtálián* tank was completed, and three other tanks were deepened and improved; and 7250 feet of roads were metalled. Streets of *Hazro* were metalled, and others paved; three latrines were built at *Hazro* and *Attok*; in the other towns, five tanks were constructed, and streets were paved, and a latrine for women was built at *Makhad*. Tanks and reservoirs were constructed at *Murree*, and the roads, retaining walls and railings were improved or renewed.

322. Thirteen tanks and four wells were constructed in the *Rawul Pindee* District.

## Huzara District.

323. Further progress was made with the pacca drains of *Hartpur* in *Huzara*, where also a tank and filter, and a latrine, were constructed; and improvement was in progress to the road connecting *Nawáshahr* with the road to *Murree*.

## Peshawur District.

324. Several hollows near villages in *Yusafzai* were filled and levelled. The *Peshawur* city drainage work was continued, a fire-engine was purchased; the circular road and roads in the city were improved; city gateways were built; the cattle market and Mackeson Mandi, and wells in the city, were improved; and marshy ground near the *Sháhi Bágh* was drained.

## Bunnoo District.

325. Drains and drain bridges, pacca paving, and a bathing ghát, were constructed at *Bunnoo*; a well at *Lakki*; and improvement of road at *Kálabágh*.

## Dera Ismael Khan District.

326. The brick paving of main streets of *Dera Ismael Khan* was continued; three bridges were built across the circular road, to allow of the gardens being irrigated from the *Lúni*; eight new gateways were built at *Koláchi*, and a meeting house for the Municipal Committee; and the town drainage was improved. Latrines were built at *Bhakkar* and *Leiah* and other towns.



MIS. PUB. LRPTS.

Dera Ghazi Khan  
District.

327. The masonry drainage of *Dera Ghazi Khan* was completed; a gateway and some latrines were built for the town; a bund was built to protect the town of *Tausa*; a Committee house at *Jámpur*; a bathing place and drains at *Bajunpore*; and improved shop-fronts at *Dájal*.

328. A masonry well was in progress at *Hairo Gurcháni*, in the *Dera Ghazi Khan* District, which, when completed, will supply a large number of villages. It is estimated to cost Rs. 3,672, and is being constructed partly from the District Fund and partly from private contributions.

### PART III.—(IMPERIAL) IRRIGATION.

IRRIGATION.

BARI DOAB CANAL.

329. The ordinary maintenance operations of repairs to works and channels, and silt clearance, were executed in the revenue-paying Divisions during the year.

330. *Original Works*.—The erection of the boundary pillars for the demarcation of canal lands was completed. 1st Division.

331. *Repairs*.—There was a breach of the *Sujánpur* drainage cut in July, caused by the heavy local rain, which did some damage to the canal.

332. The canal was closed for repairs and clearance during part of the months of January and February 1874. The whole of the masonry works were carefully inspected, and repaired where necessary.

333. The lengths of channels cleared during the year were—

Main canal ... ..	5650 lineal feet.
Distributaries ... ..	117 miles.
Navigation channel ... ..	6 „

334. The whole of the buildings in the Division were kept in repair.

335. The inlet to the canal above the permanent weir, which was opened in the previous year, has worked satisfactorily. Owing to the silt above the outlet not having been cleared away, it was found on the subsidence of the River *Rávi* in October that only one-third of the gates of the outlet could be raised on account of their being silted over. A temporary bund had to be thrown up to maintain the supply in the canal. No timber entered the canal during the floods, but a good deal passed along the face of the inlet and over the outlet.

336. The highest flood in the *Rávi* during the year was on 31st July 1873, when the discharge obtained from observations was 74,845 cubic feet per second. The river was at its lowest on 19th January 1874, when the discharge shown by measurements was 1415 cubic feet per second.

## IRRIGATION.

BARI DOAB CANAL.  
1st Division.

337. Light concrete arches, two feet wide, have been built from pier to pier over most of the rapids, in substitution of the timber kurries, or planks, previously used, which were continually being stolen, and were dangerous for foot passengers. The cost of these has been found from experience to be less than that of a footway of the same width made of planks.

338. The Post Office Authorities having run their vans up the canal road from the Sirna bridge to *Mádhapur*, it was found necessary for the safety of passengers to erect a fence on the waterside of the road. A strong earthen bank, three feet in height, was accordingly made.

339. At the same time as the high flood in the *Rávi* (in July 1873), both the *Chakki* torrent and the *Biás* river were in flood, and their combined waters topped the *Pakhwál* defence bund. The bunds at *Dhángu* were all breached, and the old revetment wall in the Cut, which had suffered severely from the floods in former years, was again considerably damaged.

340. *Plantations*.—Besides the ordinary maintenance of existing plantations and nurseries, 380 young trees were planted out.

341. *Discharges*.—Discharges of the Rivers *Rávi* and *Biás* were taken on the dates given, and with results as follow :—

*River Rávi at Sidhowri.*

	Cubic feet per second.			
19th April 1873 ... ..	...	...	...	5,015
31st July 1873 ... ..	...	...	...	74,845
22nd September 1873 ... ..	...	...	...	5,081
19th December 1873 ... ..	...	...	...	2,064
19th January 1874 ... ..	...	...	...	1,415
20th March 1874 ... ..	...	...	...	5,548

*River Biás at Pakhowál.*

19th April 1873. ... ..	...	...	...	7,088
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*River Biás at Nowshera.*

20th September 1873 ... ..	...	...	...	24,437
19th December 1873 ... ..	...	...	...	3,502
19th January 1874 ... ..	...	...	...	2,700
19th March 1874 ... ..	...	...	...	8,156

## 2nd Division.

342. *Original Works*.—The substitution of permanent irrigation outlets for the wooden ones formerly in use was suspended till December 1873, pending the submission of an accurate register of the areas to be provided for in each case. Orders were issued, and this work will now be pushed on.

The number constructed up to date is ...	4254
" " " during year was ...	422
Total number estimated for is ... ..	7515

343. A new mill-house, provided with three pair of stones, was built at the tail of the *Alíwál rájbahá*.

344. The parapets of two bridges at *Bhúchar* and *Luliani* were built of bricks in lime mortar, in substitution of those previously temporarily erected of bricks in mud mortar.

## IRRIGATION.

BARI DOAB CANAL.  
2nd Division.

345. *Repairs.*—During the closure of the canal in January and February 1874, the usual clearances of silt were executed on the following lengths of main canal and distributaries :—

	Miles.
Main Branch ... ..	93
Lahore Branch ... ..	63
Distributaries ... ..	104

in addition to the clearing of the heads of two distributaries in September and October 1873.

346. The whole of the main channel, 156 miles in all, was cleared of jungle, in addition to 520 miles of distributaries.

347. The total quantity of silt deposit excavated was—

	Cubic feet.
From Main Branch ... ..	2,676,619
„ Lahore Branch ... ..	691,213

The *Pamián* weir on the Main Branch Lower was, on the closure of the canal, found to be in a very bad state, the flooring having sunk and been partially undermined. This was put in thorough repair, and a concrete curtain wall added for its protection.

348. A new head was built for the supply of the *Bhúchar* mills. The canal road, which had before been carried on the right bank of the canal, was transferred to the left bank for a distance of 15 miles.

349. *Plantations.*—The usual maintenance of the line trees along the canal was carried on during the year, as well as the care of existing nurseries; 1324 young trees were planted out on the Main Branch and 1100 on the Lahore Branch. Some bamboos have been tried as an experiment, as well as about 32 acres sown broad-cast with kikar seed, but the severe frost killed many of the young plants. Mulberry trees have also been planted in some places.

350. *Discharges.*—The discharges of the River Rávi were taken at the following places :—

	Cubic feet per second.
At Sháhdarah on 19th December 1873 ...	456
„ on 19th January 1874 ...	1861
At Alphay on 19th January 1874 ...	1769

The discharge of the Rávi at *Alphay* on the 19th of December 1873 was so small that the velocities could not be ascertained with any accuracy, the floats being carried from side to side of the stream. The canal was closed for repairs when the discharges of the 19th January 1874 were taken.

351. The *Kasúr* and *Sobraon* Branches now in course of construction form this Division. Expenditure is chargeable to Loan Funds.

3rd Division.

*Excavation of Channel—*

	KASUR BRANCH.	SOBRAON BRANCH.
	Cubic feet.	Cubic feet.
Total excavated to date is ..	65,480,896	57,958,791
Ditto during year was	10,939,494	4,382,930

## IRRIGATION.

BARI DOAB CANAL,  
3rd Division.

No new ground remains to be opened ; the work executed and in progress during the year was composed of the trimming and dressing of banks. The trimming of the old excavation on the Kasúr Branch has been commenced, as well as the alterations required in some places in the section of the bed.

352. *Masonry Works.*—The preparation of the detailed designs and estimates for each separate work has delayed the progress under this head, but many of the estimates have now been sanctioned, and the works are being pushed on.

353. One first class inspection bungalow was completed during the year, and seven others were in progress. Four of these are nearly complete, only a few of the fittings remaining to be executed. Seven second class inspection bungalows were in progress, two of which are just completed.

354. The regulating head at the bifurcation of the two branches was in progress, and was carried up to two feet above the flooring on the Kasúr and to 10 feet above the flooring on the Sobráon side. Sixteen falls with bridges were in course of construction ; four of these were up to the crest, and the others in various stages of progress ; two only being incomplete as to foundations. Of seven ordinary bridges in progress, five were ready for their arches, one half-way up to springing, and one just commenced.

355. The detailed estimates for the distributaries are now about half completed.

356. The quantities of the principal building materials collected during the past year were—

		KASUR BRANCH.		SOBRÁON BRANCH.	
		<i>Number.</i>		<i>Number.</i>	
Bricks	.. ..	523,210		250,221	
		<i>Cubic feet.</i>		<i>Cubic feet.</i>	
Stone lime	.. ..	281		1,508	
Kunkur	.. ..	1,400		6,872	

The past season was very unfavorable for the prosecution of masonry works. Many of the kilns burned by Contractors having turned out badly, they will not again undertake the brick-making in isolated spots almost devoid of fuel. Bricks are now being made departmentally.

## Special Works Divn.

357. All work connected with the new Head Works of the Bári Doáb Canal is comprised in this Division as well as the general remodelling of the whole canal.

358. *Rávi Weir and Head Works.*—The weir and inlet were completed, and the effect of the monsoon floods on the new works awaited. No flood of any great magnitude occurred during the season, and the scouring of silt from the front of the outlet did not take place in consequence, as was anticipated ; but a further deposit of silt ensued completely burying the gates of the outlet, causing much damage both to the gates and also to the gearing for raising them. The inlet also was considerably silted up.

## IRRIGATION.

BARI DOAB CANAL.  
Special Works Divn.

359. In November the falling gates of the outlet were removed and examined, the damages made good, and the framing of the gates strengthened by the substitution of Sál timber in place of Deodár, which was previously used. Some slight alterations were also effected in the gearing for raising the gates into position.

360. A small portion of the weir which was damaged was repaired, and the dry boulder paving renewed. The large bund constructed for training the river was found to work very satisfactorily. It was slightly damaged by the floods, and has since been repaired.

361. During the closure of the canal for repairs in the months of January and February, the whole of the silt in front of the outlet and above and below the inlet was removed.

362. *Remodelling Main Canal.*—This work has been suspended pending the submission of a revised estimate for the general remodelling of the canal. This estimate was submitted in a complete form in January, and was forwarded to the Government of India.

363. No further progress was made in the collection of materials; those already reported as being collected at site of works being nearly sufficient to complete the remodelling.

364. The alteration of the saw-mill buildings to accommodate the machinery of the workshops was nearly completed.

Workshops Division.

365. The machines have been transferred from the shops on the east bank, and almost the whole of the new building is now occupied.

366. The quantities of iron-work executed in the workshops during the year were—

	<i>Maunds.</i>				
Castings .. .. .	..	..	..	..	917
Wrought-iron .. .. .	..	..	..	..	333

showing a decrease in out-turn under both heads as compared with the previous year.

367. The cost of out-turn both in castings and wrought-iron shows a decrease on that of previous years.

368. The operations in the revenue-paying Divisions of this canal were confined chiefly to the ordinary maintenance operations.

WESTERN JAMNA  
CANAL.

369. *Original Works.*—The new inspection bungalow at *Jagádhri*, mentioned in last report, was commenced, and has been nearly completed. Work was delayed owing to the non-receipt of timber from the Forest Department.

Karnál Division.

370. A cut for the diversion of a portion of the drainage of the Pandoi nallah into the Somb river was commenced, but the work was much delayed by the difficulty in obtaining possession of the land, which is in a free state. Permission to take up the land has since been obtained, and the work will be pushed forward as soon as the crops are cut.

## IRRIGATION.

WESTERN JAMNA  
CANAL.  
Karnál Division.

371. *Repairs.*—This canal was closed for repairs and clearance during part of the months of January and February 1874.

372. The canal banks were raised and strengthened between *Budha Khera* and *Gharaunda* at an expenditure of Rs 7,469.

373. Slight repairs were executed to the *Tájáwálah* and *Jamna* bunds.

374. During the closure of the canal 296,000 cubic feet of silt were excavated on distributaries.

375. *Plantations.*—Fifty acres of young trees have been planted during the year, and the existing plantations maintained.

Delhi Division.

376. During the closure of the canal in January and February, the last seven miles of the canal at the tail at Delhi were cleared of silt deposits, the quantity excavated being 948,244 cubic feet.

377. The total length of distributaries and water-courses cleared from silt during the closure was 120 miles.

378. *Plantations.*—The existing plantations were kept up, and about 500 young trees planted out at various places on the canal banks, where space was available. The monkeys have increased to such an extent as to cause great damage to the young trees ; and, during the season for the ripening of the fruit, men are obliged to be stationed in the mango gardens for the sole purpose of keeping off the monkeys.

379. The manufacture of earthenware pipes for permanent water-course heads has been proceeded with during the year. The out-turn to date is as follows :—

Pipes burnt	..	..	..	..	4,900
Collars „	..	..	..	..	11,650
Pipes moulded	..	..	..	..	55,550
Collars „	..	..	..	..	55,144

The buildings for the machine, the sheds for drying and storing the pipes, and other works connected with the factory, are now completed.

380. The discharges of the *Jamna* at *Wazirbád Ghát* were—

				<i>Cubic feet per second.</i>
19th December 1873..	..	..	..	1,276
19th January 1874 ..	..	..	..	1,828

Delhi and Gurgáon  
Works.

381. Ordinary repairs only executed during the year.

Hánsi Division.

382. *Repairs.*—During the closure of the canal in January and February, the main channel was cleared from silt deposits from *Rer* to *Minginkerah*, and the tails of two branches were also cleared. The other branches were cleared as far as the time would permit. Eighteen distributaries were more or less cleared from silt deposits. A loop line was excavated

## IRRIGATION.

WESTERN JAMNA  
CANAL.

## Hánsi Division.

round one of the bridges on the Waisar Rájbahá, to enable a new bridge to be built, the old one having fallen down.

383. One inspection house was re-roofed, the former roof having become unsafe from damage done by white-ants. Ordinary repairs executed to the other buildings.

384. *Plantations.*—The usual maintenance operations were carried on during the year; a few young trees were planted out and some seed sown. The nurseries of young trees in this Division are considerably damaged by monkeys.

385. In this Division are the new head works on the River Jamna for the Western and Eastern Jamna Canals.

## Head Works Division.

386. The revised design for these works was submitted during the year, and sanctioned by Government of India in July 1873.

387. The whole of the land required has been marked out.

388. The masonry for the weir and sluices was commenced in July; the excavation of the foundations is now completed, and the masonry for the foundations of the sluices nearly all in. The work executed during the year was—

	<i>Cubic feet.</i>				
Excavation ...	...	...	...	...	1,383,088
Masonry ...	...	...	...	...	121,242
Crib-work ...	...	...	...	...	27,142

389. The regulator for the Western Jamna Canal was commenced in December 1873. The work executed was—

	<i>Cubic feet.</i>				
Excavation ...	...	...	...	...	215,023
Masonry ...	...	...	...	...	37,175

390. Several cuts in connection with the head works, and a protective embankment, were in progress during the year. On the former, the amount of excavation was 2,363,895 cubic feet; and, on the latter, 758,134 cubic feet of earth-work were executed.

391. The temporary buildings for the accommodation of the Officers, Subordinates, Office establishment, and labourers employed on the works, were pushed on, and are now nearly complete.

392. A tramway has been laid down for the convenience of carriage of the large quantities of materials, with very satisfactory economical results as compared with the carriage by country carts.

393. The only flood of any consequence during the year was on the 17th September 1873, when the velocities were taken, and the discharge from calculation was 162,460 cubic feet per second, or, excluding the Eastern Branch of the Jamna, which has not been previously measured, 128,778 cubic feet per second. There was also a flood on the 11th February 1874, which caused a rise of nearly five feet on the gauge at *Hathni Kund*. The temporary bunds were breached by this flood, and the work on the weir stopped for the time.

## IRRIGATION.

WESTERN JAMNA  
CANAL.  
Special Survey Division.

394. This Division comprises the actual work now in course of execution on the new distributaries, as well as the completion of the detailed designs and estimates for the other distributaries included in the general estimate for new distributaries on the Western Jamna Canal.

395. The detailed estimates for the two distributaries referred to in the report of last year were submitted, and sanctioned by Government of India. The progress on each was as follows :—

*Rájbahá No. 9.*

	<i>Cubic feet.</i>
Earth-work excavated in channel .. ..	3,084,048
Ditto ditto in foundations .. ..	13,895
Brick-work .. ..	11,966

The coffer dam for protection of the head during construction completed.

*Rájbahá No. 4.*

	<i>Cubic feet.</i>
Earth-work excavated .. ..	400,000
Brick-work .. ..	2,447

The coffer dam for protection of head during construction completed.

Great difficulty has been experienced in obtaining contractors for the works.

396. The detailed estimates and designs for *Rájbahá No. 12* were proceeded with, and have been since submitted, but this work, as well as the survey work for other projects in this Division, was greatly retarded by the transfer of Officers and Subordinates to Bengal for employment on the famine relief works ; 359 miles of survey were executed during the year.

FOUNDATION CANALS.  
Upper Satlaj Division.

397. This Division consists of the canals from the right bank of the Satlaj in the *Lahore* and *Montgomery* Districts.

398. Only ordinary maintenance operations were carried out during the year.

399. The banks and roadway of the *Khánwah Canal* below *Dipálpur* were raised to bring them above the flood level. The total amount of silt clearance executed was 21,987,000 cubic feet.

400. *Plantations.*—An attempt was made to get up a plantation at the tail of the *Upper Sohág Canal*, but most of the young trees were killed by the severe frost in January 1874.

401. *Discharges.*—The minimum discharge of the Satlaj was observed at *Kasoki* as follows :—

	<i>Cubic feet per second.</i>
19th December 1873 .. ..	6343
25th January 1874 .. ..	6161



## IRRIGATION.

INUNDATION CANALS.  
Lower Satlaj and  
Chináb Division.

402. The channels in the *Mooltan* District form this Division.

403. *Repairs*.—The greater part of the silt clearances on these canals was, as usual, effected by unpaid statute labor. The clearing of the heads of two of the canals, and portions of the clearance of eight others, were paid for from the Fine Fund.

404. The aggregate length of canals kept in repair was 706 miles, and of these about 590 miles were cleared of silt deposit.

405. The embankment, to protect the city and station of *Mooltan*, along the bank of the Chináb, was repaired, having been slightly breached by the floods on 31st July and 9th August 1873.

406. *Plantations*.—The compounds of the inspection bungalows have been planted with young trees in such places as water is available.

407. *Discharges*.—The discharge of the River Rávi was—

	Cubic feet per second.		
On 19th December 1873 .. ..	105	189	
On 19th January 1874 .. ..	73	843	

408. This Division is composed of the Indus Inundation Canals in the *Dera Ghazee Khan* District.

Dera Ghazee Khan  
Division.

409. *Repair of embankments*.—These worked well during the past season, and only a few slight repairs were required. The rapid growth of a fringe of tamarisk in front of the Sháh Jamál embankment promised to reduce the repairs to this work in future; but the river has lately encroached rapidly on its right bank, and measures are being adopted to protect the embankment.

410. The four new supply heads referred to in last year's report were enlarged and improved. Two canals were extended, and one widened. The amount of earth-work excavated was 4,025,000 cubic feet.

411. The annual silt clearances on these canals were considerably less than in the previous year. The total quantity excavated was 27,450,000 cubic feet, and extended over a length of canals of about 335 miles.

412. Boundary roads along the banks of two of the canals were partly made during the year; these have long been required from the great difficulty experienced in a proper inspection of these canals owing to the impassable state of their banks.

413. A new inspection bungalow at *Paiga* was in course of construction. The inspection houses and masonry works generally were kept in repair.

414. *Plantations*.—8000 young trees were planted out during the year, but the severe frost unfortunately killed about 1900 of the young plants. The existing nurseries were also maintained.

## IRRIGATION.

INUNDATION CANALS.  
Dera Ghazee Khan  
Division.

415. The decision of His Honor the Lieutenant Governor, in December last, on the many important questions connected with the future system of working these canals will, it is hoped, secure greater efficiency, as well as cheaper management.

SIRHIND CANAL.  
1st Division.

416. This Division comprises the first 11 miles of the main channel and collateral works.

*Excavation, Main Channel—*

			<i>Cubic feet.</i>
Total quantity to be excavated	...	...	351,558,722
Excavated during year	...	...	49,260,392
Total excavated to end of year	...	...	177,069,105
Excavation remaining to complete main channel	...	...	174,489,617

The excavation in main channel during the year shows an increase of 4,636,040 as compared with the previous one. This is mainly due to the success attending the execution of the temporary drainage cuts to the river, alluded to in last year's report, and partly to the steady working of the Locomotive engine incline, which, since October, has been bringing between five and six lakhs cubic feet of earth to spoil in each month. The drainage cuts to the river are now excavated to nearly their full depth, and with the centre drain down the main channel of the canal, there is little doubt that the 4th, 5th, 6th and 7th miles will be excavated to their full depth without any trouble. When the success of these cuts has been proved, little fear is anticipated of labor being forthcoming to complete the heavy excavation in those miles; 10,231,469 cubic feet of earth-work were excavated in the drainage cuts during the year.

*Diversions of drainages—*

			<i>Cubic feet.</i>
Total quantity to be excavated	...	...	105,618,798
Excavated during year	...	...	222,574
Total excavated to end of year	...	...	16,303,426
Remaining to complete	...	...	89,315,372

The excavation on these works has been small during the year, as the final cuts for the diversions of the large drainages cannot be executed till the masonry works for carrying them over the canal are completed.

417. The total amount of earth-work excavated during year in channels of all kinds was 59,714,435 cubic feet, being an increase of 9,678,674 cubic feet over the amount executed in the preceding year. Of this total amount, 8,608,147 cubic feet were executed by prison labor.

418. *Prison labor.*—The additional accommodation for prisoners in progress last year was completed with the exception of a few minor details. The prisoners have worked very satisfactorily, and the system now carried out leaves little to

## IRRIGATION.

SIBHIND CANAL.  
1st Division.

be desired, save that the full number of prisoners for whom accommodation is provided should be always in the Jails, and so available for the canal works.

419. *Masonry Works.*—None of these works are actually commenced, but trial wells have been sunk, and extensive borings made at the sites of several of the large bridges, to ascertain the exact nature of the strata on which the foundations will be placed. A bund has been made in the River Satlaj to enclose the head of the canal and the dam sluices.

420. *Buildings.*—The whole of the existing bungalows were kept in repair. The erection of some extra temporary buildings at Rūpar was sanctioned during the year, to provide accommodation for the increased number of Officers and Subordinates now stationed there, owing to the works connected with the extension of the railway to the quarries at *Nālāgarh*, and the general maintenance of the Canal Railway which now forms part of this Division. The buildings were all in a forward state, and will shortly be completed.

421. The quantities of principal materials collected for the large masonry works were as follows :—

	During the year.	Up to close of year.
	<i>Cubic feet.</i>	<i>Cubic feet.</i>
Boulders ... ..	222,000	582,107
Block kunkur, quarried ... ..	131,216	1,262,401
Ditto dressed ... ..	14,085	269,819
Lime materials—		
Kunkur ... ..	147,383	797,791
Lime-stone ... ..	4,699	244,910

422. *Canal Railway.*—Has worked most satisfactorily, though the maintenance has been found more expensive than was anticipated, owing to the rotting of many of the sleepers used. The branch to the block kunkur quarries at *Patarheri* was completed and opened. Kunkur is now being delivered by the railway at the sites of the masonry works on the 2nd Division of this Canal. The extension of the railway to the stone quarries at *Nālāgarh* was sanctioned during the year, and considerable progress has been made with the earth-work required. The laying in of the road has been delayed owing to the difficulty in procuring rails adapted to the work. Orders were received at the close of the year for the transfer of the requisite numbers of rails and fastenings from the Punjab Northern (State) Railway. These are now in course of delivery.

423. *Plantations.*—None have as yet been started in this Division, as the spoil banks are nowhere completed.

## IRRIGATION.

SIRHIND CANAL.  
1st Division.

424. *Discharges.*—The results of the discharges of the River Satlaj taken during the year were on—

					<i>Cubic feet per second.</i>
15th April 1873	...	...	...	...	4956
19th December 1873	...	...	...	...	4240
2nd January 1874	...	...	...	...	3507

## 2nd Division.

425. Comprises the completion of the main line of the canal to the bifurcation of the branches.

*Excavation, Main Channel—*

			<i>Cubic feet.</i>
Total quantity to be excavated	...	...	514,812,700
Excavated during year	...	...	37,301,209
Total excavated to end of year	...	...	484,275,653
Remaining to complete	...	...	30,537,047

The large decrease in quantity excavated as compared with previous year is due to the near completion of the work. The channel throughout the greater part of the Division is finished; in a few places a little deepening of the channel is required, but the larger portion of the excavation remaining to be executed is in the deep cutting of the Raipur Hill. This is progressing rapidly, and may be expected to be completed by the close of the present year.

*Diversions of drainages—*

			<i>Cubic feet.</i>
Total amount to be excavated	..	..	16,968,000
Excavated during year	..	..	1,376,089
Total excavated to end of year	..	..	15,277,839
Remaining to complete	..	..	1,690,161

The Chamkaur Escape is now taken out to full width on the lower part, but in the upper part only to half width; there is no emergent need for the completion of this, and the labor is more urgently required elsewhere. The Katlaur drainage cut was commenced and nearly half completed by the close of the year.

426. *Masonry Works.*—Detailed plans and estimates for two of these works were sanctioned during the year, the bridge over the canal at *Garhi Tarkhan*, and the syphon for the Harron Nallah, and the excavation for the foundations was commenced. The spring level at the site of the Harron syphon is on a level with the bed of the canal, and a temporary drainage cut has been made to the River Satlaj, which will drain the foundations to seven feet below the canal bed. The remainder of the foundations must be kept dry by pumping.

427. *Buildings.*—The existing buildings were kept in repair.

## IRRIGATION.

428. The following materials were collected for the masonry works :—

SIRHIND CANAL.  
2nd Division.

	During the year.	Up to end of year.
	<i>Number.</i>	<i>Number.</i>
Bricks 1st class .. ..	874,290	1,617,857
„ 2nd „ .. ..	67,400	601,482
	<i>Cubic feet.</i>	<i>Cubic feet.</i>
Block kunkur .. ..	6,517	167,460
<i>Lime material—</i>		
Kunkur .. ..	265	
Lime stone .. ..	444	

429. The drainages, which were alluded to in the last report as being ponded up, gave cause for some anxiety during the rains, as owing to the exceptionally sudden and heavy rainfall immense quantities of water came down the nallahs which intersect the line of canal. No damage occurred, except in the case of the Harron Nallah, for which a temporary drain under the patrol road had been provided. In one of the sudden floods this was carried away, and the water passed through the breach and across the canal to the end of the rains. The whole of the bunds for ponding up the drainages have since been raised and strengthened.

430. *Canal Railway.*—The whole of the maintenance of this work has been now transferred to the 1st Division.

431. *Plantations.*—The total area now planted out is 169 acres, of which nine acres were planted during the year under review. There are also 6000 superficial feet under cultivation as nurseries.

432. The excavation on this Division is still in abeyance owing to the scarcity of labor, and the fear of attracting what is to be obtained from the more important works on the Upper Divisions. About two-thirds of the boundary roads were completed on the 52 miles of the Abohar Branch.

3rd Division.

433. The compensation for the land on the Abohar Branch in the *Ludianah* District was paid for during the year, extending over a length of about 40 miles of canal.

434. *Buildings, Temporary.*—Two sets of quarters for Assistant Engineers were completed during the year. One Overseer's quarters, and the house and Office for Executive Engineer in charge of the Division were commenced. Materials were being collected at the sites of the permanent inspection bungalows. Arrangements have been made for burning the large quantities of bricks which will be required on this Division, but with great difficulty, owing to the scarcity of fuel.

## IRRIGATION.

SIRHIND CANAL.  
3rd Division.

6th Division.

435. The last ten miles of the Abohar Branch were finally located during the year.

436. *Excavation.*—Sanction having been obtained towards the close of the year to the commencement of the excavation on a portion of the 3rd feeder, which passes through a stratum of kunkur, the work was begun, but only a small portion excavated. Nine miles are now actually in progress. The excavation of the Pattialah Nallah Escape was also commenced.

437. Compensation for land for 22 miles in *Pattialah* territory was paid during the year on 1st and 2nd feeders, though this part of the canal belongs to the 5th Division, but until that Division is formed all work of absolute necessity is undertaken by the Executive Engineer in charge of the 6th Division. The necessary papers for the rest of the land required in *Pattialah* territory were under preparation, and it is expected that the other Native States interested will be in a position to hand over some of the land required during the present year.

438. *Buildings, Temporary.*—Three sets of quarters for Assistant Engineers, and three for Overseers, were completed by the close of the year, and one for an Assistant Engineer was still in progress. Four of the permanent inspection bungalows were commenced.

439. The collection of materials during the year was 2,670,000 bricks, and 5178 maunds of lime. There has been great difficulty in procuring fuel in sufficient quantities at a fair price, but this, it is hoped, will now improve.

440. *Surveys.*—Detailed surveys were made where required, especially with reference to the works in the neighbourhood of Pattialah City :—

Number of miles levelled	..	..	259 miles.
Area surveyed	..	..	28½ square miles.
Area over which operations extended	..	1580	" "

INVESTIGATIONS FOR  
NEW PROJECTS.

Swat River Canal  
Project.

441. The detailed designs and estimates for this work have been completed and since submitted.

Special Survey Division,  
Lower Bari Doab.

442. The general project for the irrigation in the Lower Bari Doab having been in part sanctioned by the Government of India, an Officer was despatched at the commencement of the working season to make the necessary surveys and levels for the detailed estimates, but he had hardly fairly started work when he had to be recalled and sent down to Bengal for employment on the famine relief works. Two more Officers were sent later in the year to carry on the surveys, one of whom had to be recalled for more pressing duties elsewhere, and the other was transferred to Bengal.

## IRRIGATION.

INVESTIGATIONS FOR  
NEW PROJECTS.Rechná Doáb irriga-  
tion.

443. The Officers were engaged during the hot weather in plotting the work executed in the field during the previous working season. The cross sections of the country lying south-westward of the Lahore and Peshawur Road to the junction of the Rivers Rávi and Chináb were plotted, and the contour lines carefully laid down.

444. The levelling and surveys were re-commenced in October, but the Officer in charge, as well as one of his assistants, were almost immediately ordered to Bengal for the relief works. As soon as another Officer could be made available, he was placed in charge of the Division. The main line has been aligned and levelled over, and enough information gained to complete the preparation of a preliminary project during the current year. Levels were also taken for the alternative scheme of Inundation Canals.

445. The aggregate work executed was—

						Miles.
Levels	...	...	...	...	...	214½
Surveys	...	...	...	...	...	721½

the area over which the operations extended was about 67,000 square miles of country.

446. A project for a new Inundation Canal from a portion of the Rávi, known as the Sidnai, to *Mooltan*, was under consideration during the latter part of the year. Sufficient data have, in the opinion of the Superintending Engineer, been obtained to decide on the practicability of the scheme.

447. The revised project for improving and extending the irrigation in the *Dera Ghazee Khan* District was completed, and referred for opinion to the Financial Commissioner.

Deráját Circle.  
Special Survey Di-  
vision.

448. The completion of this project has been delayed for some further information, which, owing to the reduction of the staff in the Division for transfer to Bengal, it has not been possible to obtain.

Sindh Ságar Doáb  
Canal.

449. The necessary levels and surveys for the preliminary report on this project were nearly completed, but the Officer engaged on it had to be transferred to Bengal before he had finished the work.

Bannú irrigation.

450. An investigation was commenced in this Doáb, but owing to the reduction in the staff before mentioned no definite results were obtained.

Jatch Doáb.

451. The plans and estimates for the embankment to protect the northern portion of the *Mozaffargarh* District were prepared and submitted.

Mozaffargarh Canals.

## IRRIGATION.

INVESTIGATIONS FOR  
NEW PROJECTS.

## Mozaffargarh Canals.

452. This work consists of a new embankment eleven miles long, and the raising and strengthening of an existing one which is sixteen miles in length. A commencement was made, and 750,000 cubic feet of earth-work were executed before the end of the year. It was expected to be sufficiently advanced to arrest the floods by the end of May.

453. The total amount of surveys and levels carried out in this Division during the year were—

					<i>Miles.</i>
Surveys and levels	..	..	..	..	1337
Levels only	..	..	..	..	155
Surveys only	..	..	..	..	232

## PART IV.—RAILWAYS.

## Guaranteed.

## GUARANTEED.

## SINDH, PUNJAB AND DELHI RAILWAY.

Damages of 1872  
repaired.Mooltan Section.  
Satlaj bridge.

## Biás bridge.

## Gaggar bridge.

454. During this year the works for repairing the damages caused to the line in 1872 were carried out, and mainly completed. Culverts giving extra waterway between the 184th and 186th miles, Mooltan Section, were commenced. At the Satlaj bridge it will be remembered that two piers were scoured away, entailing thereby the loss of three pairs of girders; the space between the ends of the portions thus separated were divided into four openings; three pier wells of 15 feet each were sunk at less intervals than those previously standing, shorter girders being used. More important alterations were necessary at the Biás; the east abutment was considerably damaged, and the next pier to it underscoured fell up-stream, carrying with it two pairs of girders. In restoring the bridge, two openings of 130 feet each were substituted for the former girders, and five additional spans of 110 feet were prolonged to the east, where a new abutment was built. The pier between the two larger spans consists of two 15 feet wells sunk up and down-stream of the centre line of the bridge; these support two strong cross box girders on which the ends of the main girders rest.

455. At the Gaggar, two iron cylinders, six feet diameter, have been sunk above and below the site of pier washed away; two cross box girders carry the ends of the main girders, which are the same as originally fell. The restoration works are estimated to cost Rs. 23,30,000, of which a portion will be



## GUARANTEED.

met from the current revenue of the line. The new workshops and its annexes at Lahore were, with trifling exceptions, completed, and the building occupied. The reservoir was finished, and was partly filled when a heavy fall of rain occurred on the 18th July; the surface water drained towards the tank, and soaked in behind the retaining walls, so that what with the swelling of the freshly rammed earth and the pressure of the semifluid into which it was converted, two walls were pushed forward, one being overthrown; considerable damage to the work was done.

New Workshops,  
Lahore.

456. At Saháranpur there were commenced three blocks of barracks for Railway servants, a bungalow for the Assistant Locomotive Superintendent, and materials were collected towards building an Institute.

Staff quarters, &c.  
Saháranpur.

457. At Gháziábád carriage repairing shed, godown and other buildings were completed.

Gháziábád.

458. The expenditure on Capital for further engineering works during the year was about six lakhs.

Expenditure.

459. In the matter of rolling-stock, 100 low-sided wagons, commenced at the close of last official year, were finished, and made over for traffic in September.

Rolling-stock.

460. Owing to a pressure of grain trade downwards to Patna, it was thought advisable to increase the stock by 250 covered goods vans,—30 were turned out, and 70 more were well in hand at the close of the year. Three locomotives were brought up from Karráchi, erected and put into working order; the engines requiring repair, but set aside, waiting the completion of the shops, were taken in hand.

461. The train service was conducted with regularity; the trains were run similarly to those last year; in addition, a large number of special goods trains were worked between Ludiánah and Gháziábád carrying grain, cattle, &c., to the East Indian Railway for the Famine Districts. A still larger number of trains might have been run, except for the difficulty of obtaining empty return vans from the East Indian Railway for those made over full. Open trucks were pressed into this service, as well as a number of passenger vehicles.

Train service.

462. This grain trade was much fostered by an order of Government to the Railway Company, reducing the cost of carriage of food grains to  $\frac{1}{8}$ th pie per maund to traders; the difference being recovered from Government to make up tariff rates; the total amount despatched to the close of the official year was about 3,247,000 maunds.

Grain trade.

## GUARANTEED.

## Use of coal.

463. For fuel coal was employed exclusively east of Phillour and wood to the west; the result of this experiment is not yet clear; the direct cost with coal per train mile is higher than for wood, but heavier trains are hauled, fewer fires occur, and incidental expenses for collecting, distributing, &c., are considerably reduced.

## Traffic receipts.

464. The traffic receipts were Rs- 49,69,191, showing an increase of over 12 lakhs on former official year. There was improvement in first, intermediate and third class; there was a falling-off in receipts connected with the movement of troops, due partly to the fewer reliefs, and to the more restricted Camp of Exercise. The goods traffic increased by 11½ lakhs, owing chiefly to the carriage of food grain.

## Arrangements for sorting letters.

465. Additional arrangements for sorting letters, and for the convenience of travelling Post Office employes, the better cooling of Railway carriages, the introduction of 3rd class return tickets, were some of the minor matters which received attention during the year.

## Employment of Flotilla.

466. The Flotilla had a considerable amount of employment given to it by the transport of materials for the Indus Valley State Railway; the expenditure was heavy in working the steamers. One steamer, the "Indus," going down-river, touched a bank, and was sunk. She was, however, recovered, and taken to Karráchi for repair.

## Accidents.

467. The principal accidents were—

Collisions	..	..	...	...	8
Getting off line	..	..	..	...	22
Fires ...	..	..	..	...	13
Running over cattle	..	..	..	...	9
Others	...	..	..	...	12
Passengers killed	..	..	..	...	1
Passengers injured	..	..	..	...	3
Railway servants killed	..	..	..	...	9
Do. do. injured	..	..	..	...	14
Others killed	..	..	..	...	6

The collisions and getting off line are due mainly to Points-men; the fires arise from sparks in wood-burning engines; with fuel trains in particular, consisting of a line of open wagons stacked with wood, fires are very numerous.

## State Railways.

## PUNJAB NORTHERN (STATE) RAILWAY.

STATE.  
—

468. The progress during the year under report has been chiefly confined to the large bridges over the Rivers Rávi, Chináb and Jhelum. Rávi, Chináb and Jhelum Bridges.

469. The condition of the works at the end of 1872-73 is summarized as follows :— Condition of works.

*Earth-work.*—75 per cent. was done.

*Ordinary flush gaps.*—Completed.

*Special gaps.*—Required only the girder superstructure.

470. *Minor Bridges and Culverts.*—All completed, except the larger ones over the back channel at mile 2 ; the Palku at mile 62 ; the Bhimbar at mile 74 ; and the one over the Cantonment road, Jhelum, at mile 103. Minor Bridges and Culverts.

*Training Works.*

471. *At the River Rávi.*—Completed, with the exception of the head works which were in hand. Training Works.

472. *At the Chinab.*—All finished, with the exception of the short length required to connect the long bund with the south abutment of the bridge.

473. *At the Jhelum.*—Fresh plans were under consideration, the original works having been much damaged by floods.

474. *Ballast.*—66½ per cent. collected. Ballast.

475. *Permanent-way.*—Material for 111 miles on works. Permanent-way.

476. *Sleepers.*—The number required for the line between Lahore and Jhelum all ready, and 69,992 prepared for the extension to Rawul Pindee. Sleepers.

477. *Stations.*—The station buildings and offices all completed, except Sháhdarah. The watering arrangements were well in hand. Stations.

478. *Telegraph.*—Two extra wires for this Railway laid from Lahore to Wazírábád. Telegraph.

*Rolling-stock.*

479. Fifty-seven metre gauge wagons and four locomotives received. Rolling-stock.

480. During the year 1873-74, the progress with the large river bridges has been— Large River Bridges.

*At the Rávi Bridge.*

481. The wells of pier No. 18, the only foundation wells out of the 32 piers that remained to be sunk this year, Rávi Bridge.

## STATE.

## Rávi Bridge.

have been finished, and the pier completed ; the superstructures above low water level to bed stone level of all the piers have also been executed.

482. The present state of the work in this bridge is summarized as follows :—All wells completed ; brick-work in superstructure and abutments 84 per cent. done ; 40 per cent. of concrete blocks for protection to flooring at abutments ; 80 per cent. of dredging ; and 132,000 cubic feet of concrete blocks for the protection of the pier foundation wells ; there is a large supply of these blocks in stock, and they are being made at the rate of 2500 cubic feet daily. The girders for the bridge are on the ground ; eight spans have been bolted together, and the arrangements for erection are well advanced. There is every probability of the bridge being ready for traffic by the end of November next.

## Training Works.

483. *Training Works.*—The head work and sluices at Mahmúd Búti have been completed.

## Bridge at mile 2.

484. *Bridge at mile 2.*—The pier foundations and half the curtain blocks have been sunk ; the abutment foundations well advanced ; the girders are on the ground ; and the bridge will, it is hoped, be completed before it will be required. The wells being pitched very close together give trouble in sinking.

*Earth-work.*

## Earth-work.

485. The embankment and approaches to the Rávi bridge have been completed close up to the abutments.

486. The permanent-way to 5' 6" gauge is laid from Lahore to Sháhdarah Sarái, and a metre gauge trackway from this to the junction with the Grand Trunk Road at mile 4. Fourteen miles of metre gauge permanent-way has been relieved from the bridge works ; is now being straightened ; and will shortly be laid on the Trunk Road towards Jhelum.

487. *Stations.*—At the Stations between Lahore and Wazírábád little has been done during past year ; they were all nearly finished ; and three, namely, Morídki, Kámoki and Gakkhar will of necessity be abandoned upon the removal of the railway to the new embankment separate from the Grand Trunk Road.

## Rolling-stock.

488. *Rolling-stock.*—Two Tank Bogie Engines, one first, one second, and one third class carriages, are at Sháhdarah ready.

*Chináb Bridge.*

## Chináb Bridge.

489. On the portion of line extending from the 58th mile to the 100th mile, the progress has been entirely confined to the works of the Chináb bridge. Here the work proposed at the commencement of the working season, viz. :—

- 81 Pier wells ;
- 12 „ basements ;
- 16 „ superstructures ;

## STATE.

and the completion of the brick-work of the Palku bridge is all very nearly finished, and is confidently expected to be so before the 1st of June.

Chináb Bridge.

490. Beyond the work above enumerated, six additional wells have been sunk for the extension of the piers to provide for the widened spans of the bridge ; these have been sunk on the down-stream side of the pier, and the original centre line of the bridge will be adhered to.

491. There was a rather serious interruption to progress with one pier of this bridge. After the wells had been sunk some 15 feet, it was found that they were on a mass of reeds and strong grass that had been put down some time ago to protect a masonry bench-mark, and that the bench-mark itself was in the way. The wells had to be taken up, a rough coffer dam driven round the site, and the reeds and grass raked up. The work was a difficult, tedious and costly one, but the difficulty has been overcome, and the wells are now sunk some 40 feet. When the above works are completed, the state of this bridge will stand thus :—The whole of the 63 pier foundations, consisting of 195 wells of 12' 6" diameter, will be completed, and there remain only the superstructure of 15 piers to be built up. The south abutment of the bridge is built up to the cornice or bed stone level. At the north abutment the foundation wells are completed, and the superstructure can be proceeded with during the flood season, being on high and safe ground. The girders are being delivered, and arrangements made to put up 10 spans by October next. To summarize, all the wells in both piers and abutments are completed. Three-fourths of the pier superstructures and one-third of the abutment superstructures, and about half the protective works to piers and abutments, are done.

492. Girders are being delivered, and ways and cranes for their erection are being put up.

493. Owing to delay in the delivery of the girders, the bridge is not likely to be open for traffic till April 1876.

494. *Earth-work.*—The approach embankment to the south abutment is well advanced and above flood level. Its completion will, it is expected, cause the silting up of channel No. 2, and so improve the site of the extension of the Harápur bund at the south abutment of the bridge, which is now the only portion of the training works yet remaining incomplete.

Earth-work.

495. *Palku Bridge.*—The altered design of the protective flooring at the abutments of this bridge has been carried out, and the south abutment completed. The girders are on the ground, and will be laid by the 1st June next.

Palku Bridge.

## STATE.

## Bhimbar Bridge.

496. *Bhimbar Bridge*.—The little that had to be done to this bridge at the commencement of the year has been done, and 75 per cent. of the boulder protection round all the piers is in place. The girders are being delivered.

## Permanent-way.

497. *Permanent-way*.—Between 3 and 4 miles of metre gauge-way is already laid on the Grand Trunk Road between the 59th mile and the Chináb bridge. Rails will shortly be relieved from the works of the bridge, and the line laid from Lahore towards Jhelum.

## Rolling-stock.

498. *Rolling-stock*.—One metre gauge engine has been worked carrying material to the bridge for some months past.

*Jhelum Bridge.*

## Jhelum Bridge.

499. During the season the foundation wells (84) for 27 piers have been successfully sunk and hearted. The wells of the 21 piers, sunk in previous years, have been hearted, and the superstructure built on them to the height of the holding down bolts. Out of the whole of the foundation wells and pier superstructures there remains only one well at pier No. 40 to be completed, and of this the first length of brick-work has been built, and the sinking commenced. The delay in this one well was occasioned by its fouling the curb of the well destroyed by the flood of 1872. The latest information is to the effect that the difficulty has been overcome. The south abutment is up to ground level, and the north abutment is within four feet of its full height. Everything will be ready at this bridge at the close of the season for the iron-work superstructure, and the girders are now in Lahore. To summarize, the wells for both piers and abutments are practically done. The superstructures of piers and abutments 90 per cent. done; protective work 50 per cent. done; no part of the superstructures has yet been delivered; consequently the bridge is not likely to be open for traffic before July 1875.

500. Early in January of current year, 1874, orders were received from the Government of India that this Railway was to be constructed on a separate embankment independent of the Grand Trunk Road. Estimates were called for to show the comparative cost of a light railway to a 5' 6" gauge, with rails 45 lbs. to the yard; of a metre gauge railway with rails 36 lbs. to the yard; and the difference of cost of constructing a new road, and utilizing the work already executed for the location of the railway on half of the Grand Trunk Road, with the cost of constructing a separate embankment to locate the metre gauge railway.

501. These estimates were duly submitted early in February; but in the meantime the Government determined the gauge of the railway, and orders were issued to lay temporarily the permanent-way for the metre gauge on the half

## STATE.

## Jhelum Bridge.

of the Grand Trunk Road already nearly completed for its reception. This work was immediately put in hand, and proceeded with as fast as the rails could be relieved from the works of the large bridges.

502. On the 24th March the Government determined on the immediate construction of the separate embankment, and accorded a money sanction of Rs. 5,95,480 for the acquisition of the necessary land and execution of the earth-work.

503. The alignment of the new railway and preparation of the plans and estimates, &c., has been entrusted to Mr. G. J. H. Glinn, with as efficient a staff as could be spared for the construction work; but the establishment of this Railway has been so much reduced by transfers to the Famine Relief Works in Bengal, that this survey circle is underhanded, and demands augmentation when possible.

504. Up to the date of report 10 miles had been staked out from Sháhdarah towards Gujránwalah, and  $9\frac{1}{2}$  miles from Kothála towards Jhelum.

*Extension beyond Jhelum.*

505. The alignment of the railway between Jhelum and Attok, following generally the direction of the Grand Trunk Road, and using where possible the half width of the road, was completed during the early part of the year under report; and in October (1873) complete plans and estimates were submitted of the line from Jhelum to Rawul Pindee, and those for the line on to Attok were at the end of the year in a forward state.

Extension beyond  
Jhelum.

506. With the orders conveyed for the alteration of the line between Lahore and Jhelum, directions were given to prepare comparative estimates between broad and narrow gauge for the railway following the route taken by Mr. Le-Mesurier from Jhelum *viâ* Rhotás passing up the Bakrálah Valley towards Rawul Pindee. These were prepared, but not submitted, as the narrow gauge was finally decided on; but it has been subsequently determined that the general direction of this route will be the best for the extension towards Rawul Pindee.

507. The general direction of the new alignment for the railway is parallel with the Grand Trunk Road at a distance of about one quarter of a mile.

*Expenditure.*

508. The original Budget grant for this railway was Rs. 40,59,000; but in November 1873, the Government of India, in its Resolution No. 2997 dated 14th November 1873, ordered the "immediate curtailment of all expenditure that can be reduced, postponed or dispensed with," in consequence of the failure of the crops in Bengal, and anticipated scarcity and distress, and serious loss of revenue.

## Expenditure.

## STATE.

## Expenditure.

509. The grant was consequently reduced to Rs. 36,00,000 by the elimination of the provision for the active prosecution of the works on the extension beyond Jhelum, and the postponement of the manufacture of rolling-stock.

510. Early in February of current year, the Government directed that the expenditure should be scrutinised, and reductions made with a view to the saving being applied elsewhere. This resulted in the Budget grant being further reduced to Rs. 26,00,000, and fresh detail appropriations working up to this reduced amount were accordingly prepared. The actual expenditure, it is believed, is Rs. 25,23,286, as shown in Form N. of the accompanying statement furnished by the Deputy Controller of Accounts for this Railway; but the actual expenditure under each final head of account is not obtainable from this statement, and the detail statements of appropriation and outlay accounts have not as yet been received from the Deputy Controller; but the Government orders above referred afford sufficient reason for any differences between the appropriations and outlay.

511. The orders contained in Resolution No. 1814—16 A—S-R dated 7th November 1873, upon the "appropriation and outlay accounts of this Railway for 1872-73," have been, as far as possible, herein complied with.

## INDUS VALLEY (STATE) RAILWAY.

## Previous History.

512. This line was first surveyed by Mr. Brunton about the year 1865, on behalf of the Sindh Railway Company, it being the "Connecting Link" between that line and the Punjab Railway Company's line from Mooltan to Lahore. The general line of his survey coincides with that now adopted, except that Mr. Brunton made no detour to Shujaábád, and to avoid the Mírpur floods he kept further out into the desert; he also surveyed an alternative line for the section below Sakkar, not crossing the Indus at that place, but keeping to the left bank all the way to Hyderábád.

513. The upper section of the line from Mooltan to Rohri (270 miles) was surveyed as a State line in the cold weather of 1870-71, and was divided for that purpose into two Districts, viz., the Mooltan District, comprehending the upper 137 miles, and divided into three Divisions; and the Rohri District, of 133 miles, divided into two Divisions.



## STATE.

## Previous History.

514. Sanction was given by the Government of India in November 1871 to the works generally of both Districts, excluding the Satlaj bridge, and a commencement was made shortly after. The Rohri District was further sub-divided for this purpose, so as to form three Divisions, the Upper Division being partly formed by a length of 15 miles taken from the lower end of the Mooltan District; the name of this Lower District was then altered from "Rohri" to "Upper Sindh."

515. The lower section of the line from Rohri to Kotri (about 230 miles) was formed into a 3rd District for survey purposes in January 1872, and called the Lower Sindh District; the preliminary survey was completed during that season; general approval to the location and designs was accorded by the Government of India in November 1872, and work was commenced shortly after.

516. In December 1871, an Engineer-in-Chief was appointed to the general charge of the whole line from Mooltan to Kotri, and his Office was formed at Mooltan in February 1872.

517. The two large bridges on the line, the one over the Satlaj near Bahawalpur, and the other over the Indus at Sakkar, were included,—the former in the Mooltan District and the latter in the Lower Sindh District, for the purposes of survey, collecting information, river observations, &c.; and in July 1872, a design for the Satlaj bridge, prepared by the Superintending Engineer Mooltan District, was submitted to the Government of India. This design consisted of 39 spans of 40 metres each, the piers resting on three wells of  $12\frac{1}{2}$  feet diameter, sunk 60 feet; a scheme for training works was also submitted. Neither the proposed design nor the training works, however, met with the approval of the Engineer-in-Chief, and the Government therefore ordered trial wells to be sunk to a depth of 100 feet, in order to ascertain beyond a doubt the real nature of the bed; three of these were sunk during the working season 1872-73, and another design for the bridge was submitted in February 1873, prepared by the Engineer-in-Chief; the Bridge Division having, in the meantime, been separated from the Superintending Engineer's District, and brought under the immediate superintendence of the Engineer-in-Chief.

518. The surveys and observations connected with the Indus bridge were prosecuted under the direct control of the Engineer-in-Chief. To avoid the necessity of bridging the large opening between Rohri and Bakkar, Mr. Campbell, then Engineer-in-Chief, when at Sakkar in December 1872, proposed another crossing opposite New Sakkar; a preliminary report was submitted shortly after, and trial wells, surveys and borings were directed to be proceeded with, wherever practicable, on the line of both crossings.

STATE.Previous History.

519. The present state of the questions of crossing these two rivers, the Satlaj and the Indus, is described in the part of this report relating to the operations of the year just expired, 1873-74.

520. A final re-distribution and equalization of the charges forming Districts was made in January 1873, whereby the Khánpur Division of the Upper Sindh District was transferred to the Mooltan District, and the Larkhána Division of the Lower Sindh District to the Upper Sindh District, the two Bridge Divisions still remaining under the personal direction of the Engineer-in-Chief. In the month of December 1873, however, it was found expedient to place the Satlaj Bridge under the control of the Superintending Engineer Mooltan District.

521. The state of the works at the commencement of the year may thus be summarized from the Progress Report of 1872-73 :—

522. In the Mooltan District, comprising the Shujaábád, Satlaj Bridge, Satlaj River Conservancy, Baháwalpur and Khánpur Divisions, extending from Mooltan to the 172nd mile, 155 miles of bank had been completed, 40 miles of ballast collected, and 32 culverts built. The buildings for 8 out of the 15 stations had been completed, and 10 houses for Staff quarters had been erected. About 35 lakhs of bricks had been prepared for the Satlaj Bridge, and also sufficient bricks, for three lakhs of cubic feet of brick-work, had been manufactured for minor bridge works on the line.

523. The Upper Sindh District comprises the Rehti, Ghotki and Larkhána Divisions, and extends from the 172nd to the 338th mile, excluding 15 miles at Sakkar, which form the Indus Bridge Division. In the 151 miles forming this District, the embankment of 32 miles had been completed, and 57 more were in progress. No ballast was ready, and no building material had been collected. In the Larkhána Division the line had not been marked out; the Executive Engineer had but just joined, and he had not been provided with any staff. The buildings of 5 stations out of the 14 required in the District had been nearly completed, and those of 5 others had been commenced.

524. At the Indus Bridge very little had been done; some observations of velocities, &c., had been obtained, and some progress made in sinking two trial wells. An Executive Engineer had but just been appointed.

525. The Mehar, Sehwan and Kotri Divisions, aggregating 162 miles, form the Lower Sindh District; here a mere commencement had been made at the close of 1872-73; the staff, however, was thoroughly organized, and everything prepared for earnest work.

## STATE.

526. The progress made during the past year 1873-74 will first be detailed Division by Division, and then be summarized by Districts for comparison with the foregoing. Progress in 1873-74.

527. The embankment had already been completed in 1872-73. During the past year ballast for 13 miles has been collected, making an aggregate of 35 miles completed, in Depôts, and on the line: the collection has been purposely retarded in connection with a discussion of the nature of the junction with the Sindh, Punjab and Delhi Railway at Mooltan, to be brought forward on the decision of the gauge question. Shujaábád Division.

528. Modifications of the arrangements for passing irrigation water have increased the number of culverts and bridges from 163 to 174; of these 115 have been built during the year, making 145 completed; 12 others are necessarily held over for decision of the gauge question; the remainder will be finished in April. These bridge works have all been left incomplete on one side so as to admit of increased width being given to them, should the 5' 6" gauge be ordered. The arrangement is an awkward one of course, and the bridges must ever exhibit the disfiguring mark of the junction in the work, which is to be regretted.

529. Permanent-way metre gauge has been laid on the Hamdi to Shujaábád Store Branch, 8 miles long, and extended as a tramway 5 miles towards Adamwáhan; the laying of this tramway telescopically is in rapid progress. Should the metre gauge be adhered to, it will form part of the permanent main line. Three locomotives and 10 low-sided wagons have been erected on the spot, and others are in course of construction for this line.

530. Sawing machinery has been set up at Hamdi, and a large stock of Deodár timber,  $3\frac{1}{2}$  lakhs cubic feet, has been purchased; everything is ready for the rapid conversion of sleepers on settlement of the gauge question. In the meantime the machinery is fully occupied with preparing stuff for ballast wagons, and in anticipation of the general requirements of the Satlaj Bridge.

531. The Mooltan Station buildings are of necessity deferred till the gauge is decided; the buildings of the other four road-side stations are complete; those of two falling within the work of the past year. Two Staff quarters have been built during the year at Shujaábád.

532. Within three months after receipt of orders on the gauge question, should the decision be in favor of the metre gauge, the line from Mooltan to Adamwáhan might be opened for traffic.

533. During the year, the general features of the design for the bridge over the Satlaj have been decided by Government. It is to consist of 16 spans of 264 feet between centres. Satlaj Bridge Division.

## STATE.

## Satlaj Bridge Division.

of piers. The piers are to be founded each on three cylinders 18' 9" in diameter, sunk to a depth of 100 feet below low water. Preparations are now being made with a view to commencing work on the 1st November. During the year 60 lakhs of bricks have been made, raising the available stock to 90 lakhs out of a total of 160 lakhs required, and 45,000 maunds of lime-stone have been supplied, with 16,000 maunds of charcoal. The workshop has been built, and the machine tools set up, and a commencement is about to be made on the iron-work for well curbs. The completion of the bridges on the Punjab Northern (State) Railway renders available for transfer a large quantity of plant and tools for well-sinking, which will be brought down by boats during the inundation season.

534. On the 13 miles of main line attached to the bridge, one mile of bank was thrown up during the year, making 11 miles completed; the remaining two miles of heavy bank in the bridge approaches are held in reserve as a sort of reservoir for labor during the erection of the bridge. Some of the minor bridges and culverts near the river are deferred for a similar purpose; the remaining 12 are complete, 11 drains and culverts having been built during the year, and one previously in 1872-73.

## Satlaj River Conservancy Division.

535. This charge was created during the year to provide for the training and control of the river, which wanders between parallels separated by some three miles, the bridge having a length of only 7 furlongs. The principal operations in connection with the training have been the preparation of material for floating spurs to be laid down on the approach of the inundation season, and the arrangement of bandels and spurs to force the present dry weather channel into a favorable position, in the expectation that on the rise of the water the river may take to it. Some success has attended these operations.

536. During the year the bank at Adamwahan opposite the colony above the bridge site was successfully protected by a system of spurs; but a considerable piece (some 450 feet deep) of the high bank at and below the bridge site was lost. The violent oscillation of the stream from which the bank has suffered during the last two years has now passed below the bridge, and a succession of several seasons of comparatively direct flow and consequent security may be expected.

## Bahawalpur Division.

537. The substitution of arched for flat topped culverts has necessitated an alteration of gradients, and a good deal of earth-work has been done to the bank reported complete at the beginning of the year. Ballast for 16 miles has been prepared during the year, bringing the supply up to 33 miles; a great improvement has been made in the quality; 150 of the 186 culverts and minor bridges required have been built

## STATE.

during the year, one side being left incomplete, as in the Shujaábád Division. The Station buildings, well advanced at the commencement of the year, have been completed ; the Staff quarters have also been completed.

Baháwalpur Division.

538. The line in this Division is quite ready for the reception of the permanent-way, immediately on receipt of orders on the gauge.

539. A tramway from Channi Ghôt Station to the river side near Uch, a distance of about 13 miles, has been laid out, and two miles of the permanent-way laid on the metre gauge. The object of the branch is to provide for the conveyance to the line of stores brought up by the Indus Steam Flotilla. A locomotive has been erected, and wagon stock is in course of being made up for this line.

540. The 14 miles of bank, untouched at the close of 1872-73, were completed during the past year. Ballast for 12 miles has been prepared. All the bricks and other material required for bridging have been manufactured during the year ; and 56 culverts out of the 106 required, and 152 lineal metres out of the 275 lineal metres of flood opening required, have been built, one side of the works being left unfinished. The whole of the bridge works of the Division will probably be completed in July next, and the line will then be ready for the permanent-way.

Khánpur Division.

541. The buildings for the three stations reported unfinished at the close of 1872-73 have been completed. The work done in this Division during the year under notice presents a very marked improvement on that of the previous year, both in quality of material and workmanship ; the brick-work executed is good.

542. The unfinished 17 miles of bank have been completed during the year, but recent modifications of the bridging will involve some changes of gradient of no great importance. Ballast has been obtained partly from the ruins of old cities, but principally manufactured for 30 miles all during the year. For the bridge works bricks have been manufactured for about 2·7 lakhs of cubic feet of work, representing nearly half of the work to be done.

Rehti Division.

543. Building is about to be commenced as the advancement of work in the northern part of the line releases the skilled labor ; it is not desirable to push these works whilst the uncertainty about the gauge continues ; many of the bridges in this part of the line are of considerable size, and it would be extremely inconvenient to leave them incomplete on one side.

544. The Station buildings are all complete, those of three stations falling within the year.

## STATE.

## Ghotki Division.

545. Eight of the nine miles of bank, untouched at the commencement of the year, have been completed in accordance with the section first approved ; but the substitution of arches for iron girders has rendered necessary a general revision of the section and increased height of formation, and consequently a large quantity of earth-work still remains to be done ; 390 lakhs of work were executed during the year. No ballast has been prepared, as it is proposed to carry out stone ballast from Rohri for the whole Division over our own rails.

546. Several modifications of the arrangements for bridging have been made, and type drawings have recently been approved ; an estimate of the gross quantity of work is under preparation. The work on the 24 miles near Rohri will be executed with stone quarried at Rohri, and carried out over the rails ; that in the other 25 miles will be built with bricks. According to the section finally considered and approved by Government, the following openings will be provided in this Division for the passage of the floods of the Indus which cross the line :—

Brick-work, 25 miles,	150,	10 feet arches.
	356,	20 „ „
	17,	6 metre girders.
Stone masonry, 24 miles,	252,	10 feet arches.
	8,	20 „ „
	2,	6 metre girders.

These openings are distributed in viaducts of various lengths. In preparation for this heavy work but a small provision of material has at present been made. Of 15 lakhs of bricks burnt by the Department, eight lakhs only are fit for bridge-work. At Rohri about 80,000 cubic feet of stone have been prepared at the quarries. A contract was given to Messrs. Collins and Petman for manufacture of bricks ; they were to commence on 1st November 1873 ; but, owing to the submersion of brick-fields and other causes, they were unable to get to work until Christmas ; the Superintending Engineer now reports that they are in full swing, expecting to turn out 15 to 20 lakhs of bricks per mensem.

547. Application is about to be made to Government for permission to lay the metre gauge line as a tramway for the 24 miles out of Rohri, and it is expected that in November, after the subsidence of the floods, a good commencement may be made, both in the brick-work and stone masonry, the tramway for the latter being carried forward as the bridges are got in.

548. The Station and Staff buildings are all complete, about half of the whole work having been executed during the past year.

## STATE.

Indus Bridge Division.

549. The work done in this Division consists almost entirely of observations of the river's current and bed, to determine the site at which the bridge should be established. Three crossings have been indicated, viz., I., from Rohri to Sakkar over the Bakkar island, involving a large span to cover the Rohri-Bakkar channel ; II., opposite New Sakkar, where the river occupies a width of 3200 feet, and where a bridge of ordinary construction might suffice ; and III., at an intermediate position where the river occupies a width of 1900 feet only, and some advantage might be obtained from the occurrence of rock in the Sakkar bank. Comparative estimates of the three proposals have just been completed for submission to Government, with the following result :—

	Rs-
Estimated cost of bridge of large span over Bakkar Island	21,07,000
"    "    "    at New Sakkar ... ..	38,67,000
"    "    "    ,, intermediate position ... ..	24,67,000

550. Proposals have also been prepared, and are on the point of being submitted to Government, for establishing a steam ferry and temporary main lines on either bank for use until the permanent bridge can be opened, and for the general arrangements of the station at Sakkar.

551. Pneumatic apparatus has been ordered from England for the further examination of the bed in the Rohri-Bakkar channel. This cannot be employed before next season, as the river has already risen considerably.

552. Some arrangements have been made to facilitate the reception of stores at Sakkar ; a wharf is being built with sheers to lift heavy weights, and a tramway laid in connection with it to carry stores back to the store-yard, where some commodious godowns have been built.

553. This Division has been unfortunate during the year in failures connected with the staff. The Executive Engineer joined just at the end of 1872-73 : of the two Assistant Engineers first appointed, and who joined early in the year, one died immediately, and the other had very shortly to be dismissed for misconduct. Nothing, therefore, was done up to July when the inundations rose beyond clearing a part of the line. The waters remained on the country until September, and then some delays occurred in obtaining possession of the land. A commencement of work on a great part of the Division was consequently not really made until January. On part of the line lying north of Nawa Dera, which passes through waste land, the Engineers got to work in September, and large bodies of Patháns presenting themselves for work, the bank was rapidly thrown up, and, by the close of the year, was practically complete from the 294th mile to the end of the Division, a length of 44 miles.

Larkhána Division.

554. The line of the remainder of the Division, according to the decision of Government, was to be carried on the

## STATE.

## Larkhána Division.

spoil bank of the Sakkar Canal ; but the inhabitants of Shikárpur presented a memorial praying that the line might be diverted to pass through that town, and the Government directing that the matter should have attention, it was necessary to stop all operations between Sakkar and Nawa Dera. This occurred at Christmas. A report has since been submitted to Government, in which adherence to the original proposals is advocated.

555. About 15 lakhs of bricks have been manufactured for the Station and other buildings, on which a commencement is about to be made.

556. The works in this Division are light ; and although they are now very backward, there should not be much difficulty in recovering the ground.

## Mehar Division.

557. The whole of the work done in the Divisions forming the Lower Sindh District may be credited to the past year.

558. In the Mehar Division, the embankment has been completed in accordance with the original scheme, of which, however, some slight modifications have recently been made. Brick ballast has been provided for three miles, and about 20 lakhs of bricks have been burnt.

559. At Ráhdan, the ~~Station~~ building is up to the roof line, and a commencement has been made on three other stations.

560. During last season temporary quarters were provided for the shelter of the staff.

## Sehwán Division.

561. The bank to the north and south of the Sehwán hills has been completed, and  $\frac{3}{4}$ ths of the rock-cutting in the Sehwán hills, as required for a metre gauge line, have been taken out. Part of the line through the hills is of necessity deferred until the gauge question is settled ; but the cutting on this portion is not so difficult as on that already completed.

562. Ballast, brick and stone shingle has been collected for three miles.

563. The station buildings at the five Stations have been completed. Temporary accommodation was run up for the shelter of the staff during last season.

564. A commencement has been made on brick manufacture for the bridge works.

## Kotri Division.

565. The bank has been completed for 50 miles ; the two miles near Kotri cannot be lined out until the settlement of the gauge question clears the way for a discussion of the means of forming a junction with the Sindh, Punjab and Delhi Railway.

566. Stone shingle ballast has been collected and laid out for 30 miles.



## STATE.

567. The Station buildings for the four stations have been completed, excepting for that at Kassaye, which is nearly ready. Kotri Division.

568. A large quantity of excellent building stone has been brought to site of the bridges, on which a commencement is about to be made ; bricks are not required in this Division, building stone being found in abundance.

569. In the following summary, the progress made is collected by Districts for comparison with the state at the close of the year 1872-73, described in paras. 521 to 525.

570. Fifteen miles of bank have been thrown up during the year, making 170 miles completed ; 43 miles of ballast have been collected, making 83 miles to date ; 332 culverts and 152 lineal metres of flood opening have been built during the year, making 363 culverts and 152 lineal metres to date. About five lakhs cubic feet of brick-work in these bridges have been executed during the year, for about a half of which the bricks have also been manufactured. The bridging of the line in this District is very nearly complete. Four stations have been built, making 14 completed ; the Mooltan Station only is deferred. Mooltan District.

571. Sixty lakhs of bricks have been made at the Satlaj Bridge, raising the total provision to 90 lakhs, and other materials have been provided, and preliminary arrangements made with a view to the commencement of work in November.

572. Sixty-nine miles of bank have been thrown up during the year, making 141 miles completed ; 30 miles of ballast have been collected, and buildings of six stations have been built, making 10 complete out of 15 required. Bricks have been prepared during the year for 4·5 lakhs of cubic feet of brick-work, and stone quarried and prepared for 80,000 cubic feet. Upper Sindh District.

573. At the Indus Bridge systematic observations have been recorded, and a report has been prepared, on which definite orders regarding the site may be expected.

574. 150 miles of bank have been completed during the year, and about  $\frac{2}{3}$ ths of the heavy rock-cutting in the Sehwan hills ; 36 miles of ballast have been collected, and buildings for nine stations completed. Bricks have also been prepared for about  $1\frac{1}{2}$  lakhs of cubic feet of brick-work, and stone quarried, brought to site, and prepared for about one lakh of cubic feet of masonry. Lower Sindh District.

575. Stated in general terms, the line from Mooltan to Khanpur, 135 miles, excluding the Satlaj Bridge, is practically ready for the permanent-way. The 50 miles near Kotri are rapidly advancing, and will probably be ready for the permanent-way before Christmas.

## STATE.

## Lower Sindh District.

576. 140 miles of rails and fittings for permanent-way have been received at Kurrachee, and are in course of distribution : of this quantity, 60 miles are sent to the Satlaj Bridge, to be used as weights, and 30 more are required near Rohri for the tramways in connection with the quarries, &c.

577. A number of wheels and axles, bearing springs and axle boxes for rolling-stock have been received at Karráchi, but none of the iron fittings for the framing and bodies. To meet the wants of Store tramways, 150 low-sided wagons are in course of construction ; the necessary iron-work being provided from the Railway Shops at Adamwáhan and other sources.

## RAJPOOTANA (STATE) RAILWAY.

## Completion of line.

578. As stated in the Report for 1872-73, the line was completed to Rewári and Farakhnagar during that year, but was not opened to the public.

## Dpening of line.

579. The above portion was opened on the 1st July 1873 ; and up to the end of March 1874, 224,267 passengers and 831,609 maunds of goods were carried by it, the earnings

## Traffic receipts.

being Rs. 45,647-12-6 from passengers, and Rs. 83,461-2-9 from goods, besides miscellaneous receipts, amounting to Rs. 14,311-14-6, during the same period, making the total receipts for the nine months Rs. 1,43,420-13-9, or £6 7s. 7d. per mile per week.

## Sábi River temporary crossing.

580. At first the railway was carried on a temporary road across the Sábi River between Jatauwli and Rewári, but the perpetual interruptions to the traffic during the rainy season caused by this arrangement induced the Government to sanction the construction of a permanent crossing ; the work which consists of six viaducts, aggregating 130 spans of 22 feet, connected by embankment, was commenced in January, and will, it is hoped, be completed before the end of June.

## Permanent crossing.

## Flood in Sábi.

581. There was an unusually severe flood in the Sábi on the 13th and 14th of August last, the water doing a great deal of mischief to the new banks for the extension line beyond Rewári, besides breaching the bank in several places between Jatauwli and Rewári. This flood necessitated a revision of the construction between Rewári and Ajeráka ; the new banks and culverts have, however, been completed, and the rails have been laid for 20 miles beyond Rewári.

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STATE.

582. The Bháwal Station buildings were damaged by the same flood. Flood damages.

583. The supply of rails for the line in Alwar has been temporarily suspended since February last, as they were required for the temporary railway constructed in Tirhoot. Fresh supplies are now, however, beginning to arrive; and if no further delay occurs, the line may be completed to its junction with the Agra District before November. Suspension in supply of rails.

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# APPENDIX A.

[ Imperial. ]

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, IMPERIAL, FOR THE YEAR 1873-74.

### Section A.

SERVICE HEADS.								Grants as per Budget Orders.	Final grants at end of year.	Outlay.
ORIGINAL WORKS.								Rs.	Rs.	Rs.
Military	...	...	...	...	...	...	...	60,000	85,000	69,699
Civil Buildings	...	...	...	...	...	...	...	89,000	43,700	14,989
Total								99,000	1,28,700	84,688
REPAIRS.										
Military	...	...	...	...	...	...	...	60,000	75,000	62,283
Civil Buildings	...	...	...	...	...	...	...	10,000	11,300	10,937
Total								70,000	86,300	73,220
Establishment	...	...	...	...	...	...	...	41,000	41,000	39,082
Tools and Plant	...	...	...	...	...	...	...	...	...	166
Net additional grant sanctioned during the year	...	...	...	...	...	...	...	46,000	...	...
Total								2,56,000	2,56,000	1,97,106
Less—Expenditure in England								3,000	...	...
Grant for expenditure in England transferred to other works for expenditure in India								...	3,000	...
Net outlay in India								2,53,000	2,53,000	1,97,106
SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE (AS PER STATEMENT ANNEXED).										
New supplies	...	...	...	...	...	...	...	10,000	10,000	1,875
Repairs	...	...	...	...	...	...	...			1,985
Establishment	...	...	...	...	...	...	...			384
Profit and Loss	...	...	...	...	...	...	...			...
Total								10,000	10,000	4,244
Less—Expenditure in England								...	...	...
Net outlay in India								10,000	10,000	4,244
GRAND TOTAL								2,63,000	2,63,000	2,01,350
Expenditure on Imperial Works from funds supplied in addition to Budget grants.									Amount of contribution.	Outlay.
Nil.										

APPENDIX A.

PART I.—concluded.

ACCOUNT OF APPROPRIATION FROM IMPERIAL FUNDS DURING THE YEAR 1873-74,  
ARRANGED BY HEADS OF SERVICES.

Section B.

SERVICE HEADS.	Grants as per Budget Orders.	Final grants at end of year.	Outlay.
	Rs-	Rs-	Rs-
<b>MILITARY.</b>			
Original Works ... ..	60,000	85,000	69,699
Repairs ... ..	60,000	75,000	62,283
Establishment ... ..	30,000	30,000	33,633
Tools and Plant ... ..	...	...	166
Net additional grant sanctioned during the year ... ..	40,000	...	...
Total ... ..	1,90,000	1,90,000	1,65,781
Less—Expenditure in England ... ..	3,000	...	...
Grant for expenditure in England transferred to other works for expenditure in India ... ..	...	3,000	...
Net outlay in India ... ..	1,87,000	1,87,000	1,65,781
<b>OTHER SERVICES.</b>			
<i>Civil Buildings.</i>			
Original Works ... ..	39,000	43,700	14,939
Repairs ... ..	10,000	11,300	10,937
Establishment ... ..	11,000	11,000	5,449
Net additional grant during the year ... ..	6,000	...	...
Total ... ..	66,000	66,000	31,325
Less—Expenditure in England ... ..	...	...	...
Net outlay in India ... ..	66,000	66,000	31,325
<b>SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE.</b>			
New supplies ... ..	10,000	10,000	1,875
Repairs ... ..			1,985
Establishment ... ..			384
Total ... ..	10,000	10,000	4,244
Less—Expenditure in England ... ..	...	...	...
Net outlay in India ... ..	10,000	10,000	4,244
GRAND TOTAL ... ..	2,63,000	2,63,000	2,01,350

# APPENDIX A.

## PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNTS, IMPERIAL, FOR THE YEAR 1873-74.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>	<b>Rs</b>	
<b>ORIGINAL WORKS.</b>		
Constructing Telegraph Office at Dera Ghasee Khan ... ..	6,000	Govt. of India, P. W. D., No. 311 A-B dated 28th August 1873.
Additional grant for Works, Military ...	22,000	Govt. of India, P. W. D., No. 361 A-B dated 3rd October 1873.
New roof to Station Hospital at Kohat ...	3,000	Punjab Government, P. W. D., No. 76 dated 26th February 1874, and Govt. of India, P. W. D., No. 273 B dated 14th February 1874.
<b>REPAIRS.</b>		
Allotment from Original Works for Telegraph repairs ... ..	1,000	Govt. of India, P. W. D., No. 387 A-B dated 28th October 1873.
Additional grant for Repairs, Military ...	18,000	Govt. of India, P. W. D., No. 361 A-B dated 3rd October 1873.
Repairs to Post Offices ... ..	300	Govt. of India, P. W. D., No. 83 A-B dated 27th February 1874.
	50,300	
<b>REDUCTIONS.</b>		
<b>ORIGINAL WORKS.</b>		
Telegraph Office at Umballa ... ..	1,000	Govt. of India, P. W. D., No. 387 A-B dated 28th October 1873.
Post Office at Wazirabad ... ..	300	Govt. of India, P. W. D., No. 83 A-B dated 27th February 1874.
<b>REPAIRS.</b>		
From Repairs to Original Works ... ..	3,000	Punjab Government, P. W. D., No. 76 dated 26th February 1874, and Govt. of India, P. W. D., No. 273 B dated 14th February 1874.
	4,300	
<b>Net Addition</b> ... ..	<b>46,000</b>	

I. P. WESTMORLAND, *Captain, R. E.,*  
*Controller Public Works Accounts, Punjab.*

# APPENDIX B.

[ Provincial. ]

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, PROVINCIAL, FOR THE YEAR 1873-74.

### Section A.

SERVICE HEADS.							Grants as per Budget Orders.	Final grants at end of year.	Outlay.
ORIGINAL WORKS.							Rs	Rs	Rs
Civil Buildings	...	...	...	...	...	...	7,28,000	6,95,317	6,07,897
Communications	...	...	...	...	...	...	1,94,000	2,13,480	1,82,794
Miscellaneous Public Improvements	...	...	...	...	...	...	5,000	7,730	5,803
Total							9,27,000	9,16,527	7,96,494
REPAIRS.									
Civil Buildings	...	...	...	...	...	...	1,81,400	1,66,064	1,86,624
Communications	...	...	...	...	...	...	1,30,700	1,47,025	1,25,489
Miscellaneous Public Improvements	...	...	...	...	...	...	...	...	...
Total							3,12,100	3,13,089	3,12,113
Establishment	...	...	...	...	...	...	3,22,170	3,78,770	3,78,770
Tools and Plant	...	...	...	...	...	...	24,780	24,780	24,780
Profit and Loss	...	...	...	...	...	...	...	...	48
Additional grant sanctioned during the year	...	...	...	...	...	...	47,116	...	...
Total							16,33,166	16,33,166	15,12,205
Increase to Stock	...	...	...	...	...	...	...	...	8,455
GRAND TOTAL							16,33,166	16,33,166	15,20,660
Expenditure on Provincial Works for funds supplied in addition to Budget grants.								Amount of contribu- tions and grant-in- aid.	Outlay.
CONTRIBUTIONS.									
ORIGINAL WORKS.									
Civil Buildings	...	...	...	...	...	...	...	4,416	4,416
Miscellaneous Public Improvements	...	...	...	...	...	...	...	76	76
Total								4,492	4,492
Grant-in-aid from General Local Fund : for details see Appropriation and Outlay Account of Public Works General Local Fund								11,32,800	10,85,688
GRAND TOTAL								11,37,292	10,90,180



## APPENDIX B.

### PART I.—*continued.*

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, PROVINCIAL, FOR THE YEAR 1873-74,  
ARRANGED BY HEADS OF SERVICE.

#### Section B.

SERVICE HEADS.	Grants as per Budget Orders.	Final grants at end of year.	Outlay.
	<b>Rs</b>	<b>Rs</b>	<b>Rs</b>
Civil Buildings ... .. { Original Works ..	7,28,000	6,95,317	6,07,897
.. .. { Repairs .. ..	1,81,400	1,66,064	1,86,624
	9,09,400	8,61,381	7,94,521
Communications .. .. { Original Works...	1,94,000	2,13,480	1,82,794
.. .. { Repairs .. ..	1,30,700	1,47,025	1,25,489
	3,24,700	3,60,505	3,08,283
Miscellaneous Public Improvements { Original Works ..	5,000	7,730	5,803
.. .. { Repairs .. ..	..	..	..
	5,000	7,730	5,803
Establishment .. .. .	3,22,170	3,78,770	3,78,770
Tools and Plant .. .. .	24,780	24,780	24,780
Profit and Loss .. .. .	..	..	48
Additional grant sanctioned during the year .. ..	47,116	..	..
Total ..	16,33,166	16,33,166	15,12,205
Increase to Stock .. .. .	..	..	8,455
TOTAL OUTLAY ..	16,33,166	16,33,166	15,20,660

### PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL  
APPROPRIATION AND OUTLAY ACCOUNT, PROVINCIAL, FOR 1873-74.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>	<b>Rs</b>	
Additional grant for Jail at Rúpar ..	67,800	Punjab Government, Civil Department, No. 1296 dated 30th March 1874, and Public Works Department No. 1256 dated 31st idem.
<b>REDUCTIONS.</b>		
Reduction in grant for Military Road from Dunera to Pathánkot	20,684	Punjab Government, Public Works Department, No. 197 dated 14th January 1874.
NET ADDITION ..	47,116	

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# APPENDIX C.

[ General Local Fund. ]

PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, GENERAL LOCAL FUND, FOR THE  
YEAR 1873-74.

Section A.

SERVICE HEADS,								Grants as per Budget Orders.	Final grants at end of year.	Outlay.
ORIGINAL WORKS.								Rs	Rs	Rs
Civil Buildings	...	...	...	...	...	...	...	88,000	5,700	2,058
Communications	...	...	...	...	...	...	...	1,91,000	1,88,860	1,81,465
Miscellaneous Public Improvements	...	...	...	...	...	...	...	5,000	36,600	7,710
								2,84,000	2,80,660	1,91,233
REPAIRS.										
Civil Buildings	...	...	...	...	...	...	...	2,11,460	2,20,560	8,229
Communications	...	...	...	...	...	...	...	66,330	66,330	1,94,240
Miscellaneous Public Improvements	...	...	...	...	...	...	...			74,466
								2,77,790	2,86,890	2,71,935
Additional grant sanctioned during the year								5,760	...	...
Total								5,17,550	5,17,550	4,63,168
GRANT-IN-AID TO PROVINCIAL FUNDS.										
ORIGINAL WORKS.										
Civil Buildings	...	...	...	...	...	...	...	...	95,800	7,201
Communications	...	...	...	...	...	...	...	60,000	85,000	84,662
Miscellaneous Public Improvements	...	...	...	...	...	...	...	5,000	500	...
								65,000	1,81,300	91,863
REPAIRS.										
Civil Buildings	...	...	...	...	...	...	...	7,11,840	7,01,380	7,27,030
Communications	...	...	...	...	...	...	...	5,670	5,670	4,922
Miscellaneous Public Improvements	...	...	...	...	...	...	...			
								7,17,510	7,07,050	7,81,952
Establishment	...	...	...	...	...	...	...	2,20,880	2,34,230	2,61,250
Tools and Plant	...	...	...	...	...	...	...	10,220	10,220	623
Additional grant sanctioned during the year	...	...	...	...	...	...	...	1,19,240	...	...
TOTAL GRANT-IN-AID								11,32,800	11,32,800	10,85,688
TOTAL GENERAL LOCAL FUND								16,50,350	16,50,350	15,48,856
NET OUTLAY								16,50,350	16,50,350	15,48,856
Expenditure on General Local Fund Works from funds supplied in addition to Budget grant.									Amount of contribu- tion.	Outlay.
ORIGINAL WORKS.										
Civil Buildings	...	...	...	...	...	...	...		1,969	1,969
Communications	...	...	...	...	...	...	...		5,714	5,714
									7,683	7,683
REPAIRS.										
Communications	...	...	...	...	...	...	...		300	300
Total									7,983	7,983

## APPENDIX C.

### PART I.—concluded.

#### ACCOUNT OF APPROPRIATION FROM GENERAL LOCAL FUND DURING 1873-74, ARRANGED BY HEADS OF SERVICE.

##### Section B.

SERVICE HEADS.				Grants as per Budget Orders.	Final grants at end of year.	Outlay.
				Rs	Rs	Rs
Civil Buildings	...	...	Original Works	38,000	5,700	2,058
			Repairs	...	...	3,229
Communications	...	...	Original Works	1,91,000	1,88,380	1,81,465
			Repairs	2,11,460	2,20,560	1,94,240
Miscellaneous Public Improvements			Original Works	5,000	36,600	7,710
			Repairs	66,380	66,380	74,466
Additional grant sanctioned during the year				5,760	...	...
Total				5,17,550	5,17,550	4,68,168
GRANT-IN-AID TO PROVINCIAL FUNDS.						
Civil Buildings	...	...	Original Works	...	95,800	7,201
			Repairs	...	...	...
Communications	...	...	Original Works	60,000	85,000	84,662
			Repairs	7,11,840	7,01,380	7,27,080
Miscellaneous Public Improvements			Original Works	5,000	500	...
			Repairs	5,670	5,670	4,922
Establishment	...	...	...	2,20,830	2,34,230	2,61,250
Tools and Plant	...	...	...	10,220	10,220	623
Additional grant sanctioned during the year				1,19,240	...	...
TOTAL GRANT-IN-AID				11,32,800	11,32,800	10,85,688
TOTAL GENERAL LOCAL FUND				16,50,350	16,50,350	15,48,856
NET TOTAL				16,50,350	16,50,350	15,48,856

### PART II.

#### DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANTS TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNTS, GENERAL LOCAL, FOR THE YEAR 1873-74.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>		
Additional grant for Kangra Valley Roads...	<b>Rs-</b> 25,000	Punjab Government, Civil Department, No. 1498 dated 17th November 1873, and P. W. D. No. 4508 dated 4th Decr. 1873. Punjab Government, Civil Department, No. 326 C.
Ditto for Police Buildings ...	1,00,000	
	1,25,000	
<b>REDUCTIONS.</b>		
<i>Nil.</i>		
Net additions ...	1,25,000	

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# APPENDIX D.

[ Irrigation. ]

## PART I.

APPROPRIATION ACCOUNT OF IRRIGATION WORKS IN THE PUNJAB FOR THE YEAR 1873-74.

*Extraordinary and Ordinary.*

SERVICE HEADS.								Grant as per Budget Orders.	Final grant at end of year.	Outlay.
CAPITAL.								Rs	Rs	Rs
EXTRAORDINARY.										
Works	...	...	...	...	...	...	...	23,31,030	11,53,421	-31,354
Establishment	...	...	...	...	...	...	...	9,86,370	9,86,370	4,06,420
Plant	...	...	...	...	...	...	...	1,55,600	4,33,209	9,08,386
Suspense Balances	...	...	...	...	...	...	...	...	...	1,12,168
Total								34,73,000	25,73,000	13,95,620
Less Receipts on Capital Account	...	...	...	...	...	...	...	...	...	7,524
Net outlay								34,73,000	25,73,000	13,88,096
Less Expenditure in England	...	...	...	...	...	...	...	...	...	...
Reduction in grant	...	...	...	...	...	...	...	9,00,000	...	...
Net Expenditure in India								25,73,000	25,73,000	13,88,096
ORDINARY.										
Works	...	...	...	...	...	...	...	80,750	42,575	43,557
Establishment	...	...	...	...	...	...	...	9,574	48,974	1,27,496
Plant	...	...	...	...	...	...	...	...	500	-69,166
Profit and Loss	...	...	...	...	...	...	...	...	...	-2,32,107
Suspense Balances	...	...	...	...	...	...	...	...	...	-11,430
Total								90,324	92,049	-1,41,650
Less Receipts on Capital Account	...	...	...	...	...	...	...	...	...	-17,335
Net outlay								90,324	92,049	-1,24,315
Less Expenditure in England	...	...	...	...	...	...	...	...	...	4,614
Additional grant	...	...	...	...	...	...	...	1,725	...	...
Net Expenditure in India								92,049	92,049	-1,28,929
TOTAL CAPITAL (IMPERIAL)								26,65,049	26,65,049	12,59,167
REVENUE.										
Works	...	...	...	...	...	...	...	55,200	53,475	17,799
Maintenance and Repairs	...	...	...	...	...	...	...	4,02,000	4,02,000	4,20,573
Establishment	...	...	...	...	...	...	...	6,62,476	6,62,476	6,12,011
Tools and Plant	...	...	...	...	...	...	...	35,000	35,000	1,05,106
Profit and Loss	...	...	...	...	...	...	...	...	...	2,34,175
Total								11,54,676	11,52,951	13,89,664
Less Expenditure in England	...	...	...	...	...	...	...	1,600	1,600	...
Reduction in grant	...	...	...	...	...	...	...	1,725	...	...
Net Expenditure in India								11,51,351	11,51,351	13,89,664
TOTAL IMPERIAL								38,16,400	38,16,400	26,48,831

# APPENDIX D.

## PART I—concluded.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS IN THE PUNJAB FOR THE YEAR 1873-74.

#### Ordinary.

SERVICE HEADS.								Grant as per Budget Orders.	Final grant at end of year.	Outlay.
CONTRIBUTIONS.										
CAPITAL.								Rs.	Rs.	Rs.
Ordinary.										
Works	..	..	..	..	..	..	..	9,00,000	9,00,000	—1,61,886
Establishment	..	..	..	..	..	..	..	...	...	1,29,376
Plant	..	..	..	..	..	..	..	...	...	4,55,565
Profit and Loss	..	..	..	..	..	..	..	...	...	...
Suspense Balances	..	..	..	..	..	..	..	...	...	69,711
Total								9,00,000	9,00,000	4,92,766
Less Receipts on Capital Account								...	...	3,313
Net outlay								9,00,000	9,00,000	4,89,453
Less Expenditure in England								...	...	...
Net Expenditure in India								9,00,000	9,00,000	4,89,453
REVENUE.										
Works	..	..	..	..	..	..	..	...	...	1,402
Maintenance and repairs	..	..	..	..	..	..	..	1,39,200	1,39,200	22,306
Establishment	..	..	..	..	..	..	..	...	...	...
Plant	..	..	..	..	..	..	..	...	...	...
Profit and Loss	..	..	..	..	..	..	..	...	...	...
Total								1,39,200	1,39,200	23,708
TOTAL CONTRIBUTIONS								10,39,200	10,39,200	5,13,161
GRAND TOTAL								48,55,600	48,55,600	31,61,992

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*Controller Public Works Accounts, Punjab.*

# APPENDIX D.

## PART II

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS IN THE PUNJAB FOR THE YEAR 1873-74. Distribution of Extraordinary and Ordinary Outlay.

	New works.	Maintenance.	Establishment.	Tools and Plant.	Profit and Loss.	Suspense Balances.	Total.	Less receipts on Capital Account.	Net expenditure of the year.	Less expenditure in England.	Net outlay in India.	Grant as per Budget Orders.	Final Grant at end of year.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
<b>IMPERIAL.</b>													
<b>CANALS.</b>													
<i>Extraordinary.</i>													
Western Janna Canal	93,893	...	80,415	9,088	...	33,161	2,33,941	115	2,33,826	...	2,33,826	5,90,000	5,90,000
Bari Doab Canal	1,90,501	...	1,34,238	1,994	...	-33,663	2,93,141	1,796	2,91,345	...	2,91,345	6,46,336	6,46,336
Sirhind Canal	3,17,706	...	2,03,130	8,97,330	...	1,04,746	8,97,379	5,690	8,91,689	...	8,91,689	20,00,410	11,00,410
Special Survey Derajat Canal	-1,334	...	-88,784	-801	...	-911	-89,920	-89	-90,831	...	-90,831	74,467	74,467
Ditto Lower Bari Doab Canal	4,983	...	68,901	941	...	-1,335	71,600	28	71,473	...	71,473	1,03,740	1,03,740
Swat River Canal	...	...	13,680	46	...	...	13,679	64	13,535	...	13,535	38,901	38,901
Upper Sedaj Inundation Canals	...	...	...	...	...	...	...	...	...	...	...	47,876	47,876
Reduction in grant	...	...	...	...	...	...	...	...	...	...	...	-9,00,000	...
<b>Total A.</b>	-81,354	...	4,06,480	9,09,396	...	1,13,168	13,06,630	7,834	13,08,096	...	13,08,096	36,73,000	36,73,000
<i>Ordinary.</i>													
Western Janna Canal	3,785	...	711	...	...	-3,069	1,437	33	1,404	343	1,161	68,796	23,473
Bari Doab Canal	14,431	...	464	...	...	-7,663	7,345	...	7,343	3,053	2,991	...	...
Lower Sedaj and Chinab Inundation Canals	176	...	30	...	...	-683	-468	...	-468	...	-468	...	...
Upper Sedaj Inundation Canals	...	...	...	...	...	-309	-309	...	-309	...	-309	...	...
Indus Inundation Canals	...	...	...	...	...	-197	197	...	-197	...	197	...	...
Special Survey Derajat Canal	3,170	...	1,34,736	1,333	...	16	1,39,144	128	1,39,016	...	1,39,016	20,645	3,166
Madhopur Workshops	21,996	...	-8,465	-70,389	...	...	-3,96,964	-17,466	-3,71,478	...	-3,71,478	23,556	43,300
Additional grant	...	...	...	...	...	...	...	...	...	...	...	1,735	23,556
<b>Total B.</b>	41,857	...	1,27,466	-69,166	-2,33,107	-11,480	-1,41,660	-17,335	-1,54,315	4,614	-1,36,939	93,049	29,049
<b>TOTAL CAPITAL, A. AND B.</b>	13,303	...	5,33,916	8,39,230	-2,33,107	1,10,738	13,06,970	-9,311	13,03,761	4,614	13,08,167	36,66,049	36,66,049

# APPENDIX D.

## PART II—concluded.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS IN THE PUNJAB FOR THE YEAR 1873-74. Distribution of Extraordinary and Ordinary Outlay.

	New works.	Maintenance.	Establishment.	Tools and Plant.	Profit and Loss.	Surplus Balances.	Total.	Less receipts on Capital Account.	Net expenditure of the year.	Less expenditure in England.	Net outlay in India.	Grant as per Budget Orders.	Final Grant at end of year.
Brought forward, A. and B.	Rs. 12,303	Rs. ...	Rs. 5,33,916	Rs. 8,39,330	Rs. -2,33,107	Rs. 1,10,738	Rs. 13,53,970	Rs. -9,811	Rs. 12,63,781	Rs. 4,814	Rs. 13,69,167	Rs. 26,65,049	Rs. 26,65,049
REVENUE.													
Western Jamma Canal	694	1,20,781	2,49,356	8,151	...	...	3,73,983	...	3,73,983	...	3,73,983	4,37,440	4,37,440
Dahli and Gurgaon Irrigation Works	...	4,737	9,328	176	...	...	14,139	...	14,139	...	14,139	4,361	4,361
Bari Doab Canal	3,774	1,35,048	1,99,348	7,816	100	...	3,46,086	...	3,46,086	...	3,46,086	8,66,343	8,66,343
Madhopur Workshops	...	...	...	93,683	2,33,775	...	3,26,457	...	3,26,457	...	3,26,457	23,879	23,879
Lower Setla and Chinab Inundation Canals	...	11,896	39,178	188	...	...	50,760	...	50,760	...	50,760	87,415	87,415
Upper Setla Inundation Canals	1,436	59,837	55,089	603	...	...	1,17,034	...	1,17,034	...	1,17,034	1,39,985	1,39,985
Indus Inundation Canals	11,896	84,844	60,657	513	300	...	1,56,089	...	1,56,089	...	1,56,089	1,10,148	1,10,148
Shahpur and Sahiwal Canals	...	4,000	...	...	...	...	4,187	...	4,187	...	4,187	5,246	5,246
Minor Works	...	...	...	...	...	...	...	...	...	...	...	30,000	30,000
Reserve	...	...	...	...	...	...	...	...	...	...	...	9,980	9,980
Less expenditure in England	...	...	...	...	...	...	...	...	...	...	...	-1,900	-1,900
Reduction in grant	...	...	...	...	...	...	...	...	...	...	...	-1,728	-1,728
Total C.	17,799	4,30,573	6,13,011	1,05,106	2,34,175	...	13,99,664	...	13,99,664	...	13,99,664	11,61,351	11,61,351
TOTAL INFERRAL, A. B. and C.	30,003	4,30,573	11,45,927	9,44,336	2,068	1,00,738	26,43,684	-9,811	26,33,445	4,814	26,46,831	38,16,400	38,16,400
CONTRIBUTIONS.													
CAPITAL ORDINARY.													
Sirhind Canal	-1,61,886	...	1,39,376	4,55,565	...	69,711	4,92,766	3,313	4,99,453	...	4,99,453	9,00,000	9,00,000
Total	-1,61,886	...	1,39,376	4,55,565	...	69,711	4,92,766	3,313	4,99,453	...	4,99,453	9,00,000	9,00,000
REVENUE.													
Western Jamma Canal	...	23,306	...	...	...	...	23,708	...	23,708	...	23,708	6,300	6,300
Lower Setla and Chinab Inundation Canals	1,403	...	...	...	...	...	...	...	...	...	...	60,000	60,000
Indus Inundation Canals	...	...	...	...	...	...	...	...	...	...	...	73,900	73,900
Total	1,403	23,306	...	...	...	...	23,708	...	23,708	...	23,708	1,39,300	1,39,300
GRAND TOTAL	-1,30,483	4,49,879	12,75,303	13,99,891	2,068	1,70,449	31,60,108	-6,498	31,66,606	4,814	31,81,962	46,55,600	46,55,600

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Controller Public Works Accounts, Punjab.



# APPENDIX E.

No. 45. STATEMENT SHOWING THE PROGRESS MADE IN CONSTRUCTION OF RAILWAYS IN THE PUNJAB, AND THE STATE OF THEIR WORKING FROM 1ST APRIL 1873 TO 31ST MARCH 1874.

Name of Railway.	Total mileage open.	PASSENGERS DURING THE YEAR.				Receipts from passengers.	Receipts from merchandise and miscellaneous.	Total receipts.	Working expenses.	Net profit.	No. of European and Eurasian Staff.	No. of Native Staff.	Total Capital expended from commencement.
		1st Class.	2nd Class.	Intermediate Class.	3rd Class.	Total.							
<i>Scinde, Punjab and Delhi Railway.</i>													
Punjab and Delhi Line ... ..	553½	11,699	23,263	16,153	1,930,209	1,981,324	20,41,381	32,47,865	52,89,246	29,73,233	23,16,013		6,48,16,530
Scinde Line ... ..	109½	1,291	3,299	...	65,432	70,022	1,23,943	7,48,661	8,72,604	6,26,584	2,46,020	586	2,00,01,975
Indus Flotilla (about) ... ..	575	254	199	...	7,823	8,276	62,324	8,13,190	8,75,514	7,41,009	1,34,505		47,17,391
Total ..	1,238½	13,244	26,761	16,153	2,003,464	2,059,622	22,27,648	48,09,716	70,37,364	43,40,826	26,96,538	586	* 8,95,35,896

\* On Indian Books.

Lahore, 2nd July 1874.

JABZ LIGHTFOOT,  
Auditor.

**APPENDIX F.**  
**Forms A. & B.**  
**PUNJAB NORTHERN (STATE) RAILWAY.**  
**LIST OF CURVES AND GRADIENTS.**

FORM A.			FORM B.		
No.	Radius of curves, &c.	Length, miles.	No.	Gradients.	Length, miles.
Radius	300 feet ...	Nil.	1 in 30	...	Nil.
Do. between 300 and 400	...	Nil.	Between 1 in 30 and 1 in 50	...	Nil.
" 400 " 500	...	Nil.	" 1 in 50 " 1 in 80	...	Nil.
" 500 " 600	...	Nil.	" 1 in 80 " 1 in 100	...	14.89
" 600 " 1000	...	Nil.	" 1 in 100 " 1 in 150	...	1.82
Above 1000	...	9.11	" 1 in 150 " 1 in 300	...	5.02
Straight line	...	94.37	" 1 in 300 " 1 in 1000	...	13.32
			Above 1 in 1000	...	33.41
			Level	...	35.02
	Total miles ...	103.48		Total miles ...	103.48

# APPENDIX F.

## Form C.

### PUNJAB NORTHERN (STATE) RAILWAY.

#### LIST OF BALLAST.

Position.	Length, miles.	Character of Ballast.	Average lead, miles.	Average cost per 100 c. feet		Cost per mile.
				Rs.	A. P.	
Between 0 M. and 5 M.	...	...	...	5	0 0	3,644
" 5 " " 60 "	...	Brick, cubic feet 364,489	Nil.	6	6 9	3,117
" 60 " " 71 "	...	Brick and kunkur, " 2,669,601	Nil.	6	8 0	3,191
" 71 " " 101 "	...	Brick, " 540,065	Nil.	6	4 0	3,125
" 101 " " 103 "	...	Brick and stone, " 1,497,410	Nil.	6	8 0	3,970
And Jhelum station-yard 1½ mile	...	Brick and stone, " 201,524	Nil.	6	8 0	3,970
Totals	103½	...	...	6	4 8	3,210

**APPENDIX F.**  
**Form D.**  
**PUNJAB NORTHERN (STATE) RAILWAY.**  
**LIST OF IMPORTANT WATERWAYS.**

Name of River.	Position, miles.	Drainage area, square miles.	Rise of flood water above low water level.	Declivity of bed, feet per mile.	Maximum velocity in flood, feet per second.	Openings proposed.					Character of foundation.	REMARKS.
						Number.	Clear span.	Flood area, feet.	Flood discharge, feet per second.	Value of K.		
Rávi Bridge ... ..	3	Not known.	11.6	3	Unknown.	33	90	21,932	105,100	..	Wells. 3	All wells 12' 6" diameter.
Chináb " ... ..	64		11.0	3		64	133½	45,233	227,974	...	3	Ditto ditto.
Jhelum " ... ..	102		14.6	3½		50	90	28,800	221,650	..	3	{ One well 12' 6" diameter. Two wells 10 feet do.

NOTE.—This list is completed from the best information available.

# APPENDIX F.

## Form E.

### PUNJAB NORTHERN (STATE) RAILWAY.

#### ABSTRACT OF WATERWAYS.

Clear Spans.		Total area of Waterway.	Area per mile of Railway.	REMARKS.
In culverts and bridges not exceeding 10 feet clear span	...	963	9	
"	...	920	9	
20 "	...			
40 "	...	20,309	200 nearly.	
"	...	31,904	300 "	
Gaps and flood openings	...	34,155	331 "	
Rávi Bridge	...	93,866	911 "	
Chináb	...	65,250	633 "	
Jhelum	...			
Total	...	2,47,367	2,400	

# APPENDIX F.

## Form D.

### PUNJAB NORTHERN (STATE) RAILWAY.

#### LIST OF IMPORTANT WATERWAYS.

Name of River.	Position, miles.	Drainage area, square miles.	Rise of flood water above low water level.	Declivity of bed, feet per mile.	Maximum velocity in flood, feet per second.	Openings proposed.					Character of foundation.	REMARKS.
						Number.	Clear span.	Flood area, feet.	Flood discharge, feet per second.	Value of K.		
Rávi Bridge ... ..	3	Not known.	11.6	3	Unknown.	33	90	21,932	105,100	...	Wells. 3	All wells 12' 6" diameter.
Chináb " ... ..	64		11.0	3		64	133½	45,233	227,974	...	3	Ditto ditto.
Jhelum " ... ..	102		14.6	3½		50	90	28,800	221,650	...	3	{ One well 12' 6" diameter. Two wells 10 feet do.

NOTE.—This list is completed from the best information available.



**APPENDIX F.**  
**Form F.**  
**PUNJAB NORTHERN (STATE) RAILWAY.**  
**ABSTRACT OF LARGE BRIDGES.**

Name of River, &c.	Position, miles.	OPENINGS.		HEIGHT OF UNDERSIDE OF GIRDERS.			ESTIMATED COST, IN RUPEES.			REMARKS.
		Number.	Clear spans.	Above flood level.	Above river bed.	Above top of wells.	Piers, abutments, including foundations.	Superstruc- ture without rails & sleepers.	Total.	
Back channel of Rávi..	..	2	3 37' 6"	1-0	12-5	12-5	1,14,557	6,097	1,20,654	
River Rávi ..	..	3	33 90' 0"	8-6	20-0	20-0	12,11,493	4,95,000	17,06,493	
Palku nallah ..	..	62	9 37' 6"	2-9	11-3	11-3	1,57,778	23,631	1,81,409	
Chináb river ..	..	64	138' 4"	9-0	19-6	20-0	21,10,519	23,45,600	44,56,119	
Bhimber river..	..	73½	20 37' 6"	2-8	12-3	17-3	53,531	40,687	94,218	
Jhelum river ..	..	102	50 90' 0"	8-6	20-8	23-0	8,57,460	7,90,000	16,47,460	



# APPENDIX F.

## Form G.

### PUNJAB NORTHERN (STATE) RAILWAY.

#### LIST OF STATIONS.

Name.	Class.	Position, miles.	DISTANCE APART.		On what gradient.	On what curve.	Total estimated cost.	REMARKS.
			Station to Station.	Of Engine Station.				
Lahore ..	...	...	...	100	Level	Straight	Rs 8,026	Embankment and station-yard enclosure.
Shahdara ..	3rd	5	5		1 in 985	"	16,079	
Moridki ..	"	17	12		" 2765	"	12,256	
Kamoki ..	"	29	12		" 736	"	12,508	
Gujranwala ..	"	41½	12½		" 1800	"	16,617	
Gakthar ..	"	51	9½		" Level	" Radius 6366	12,888	
Wazirabad ..	"	61½	10½		" 1429	Straight	12,593	
Gujrat ..	"	70½	9		" 400	" Radius 3403	11,692	
Lala Musa ..	"	82	11½		" 300	"	9,432	
Kharian ..	"	92	10		" Level	Straight	8,577	
Jhelum ..	2nd	103	11				39,628	
...		Average	10½	...	...	Total ..	1,52,261	

# APPENDIX F.

## Form H.

### PUNJAB NORTHERN (STATE) RAILWAY.

#### LIST OF STATION MACHINERY, &c.

NAME OF STATION.	Number required.															
	Well.	Tank.	Lifting gear.	Points and cross-ings laying.	Signal sets.	Wegh bridge and Office.	Traverses.	Weighing machine.	Goods crane.	Fuel platform.	Loading gauge.	Locking blocks.	Turn-table.	Water column.	Engine turn-table.	Dating Press.
Sháhdarah	1	1	1	3	3	...	...	2	...	1	1	1	...	1	...	1
Mordki	1	1	1	3	2	...	...	2	...	1	...	1	...	1	...	1
Kámoki	1	1	1	3	2	...	...	2	...	1	...	1	...	1	...	1
Gujránwálah	1	1	1	4	2	1	...	2	...	1	...	1	...	1	...	1
Gakkhar	1	1	1	3	2	...	...	2	...	1	...	1	...	1	...	1
Wazírábád	1	1	1	4	4	...	...	2	...	1	...	1	...	1	...	1
Gujrát	1	1	1	3	2	...	...	2	...	1	...	1	...	1	...	1
Lála Músa	1	1	1	3	2	...	...	2	...	1	...	1	...	1	...	1
Khárián	1	1	1	19	4	1	1	4	1	2	1	4	1	2	1	1
Jhelum	1	1	1	19	4	1	1	4	1	2	1	4	1	2	1	1
Total	10	10	10	48	25	3	1	22	1	11	3	13	3	11	3	10
Average number per 100 miles of Railway ...	10	10	10	47	24	3	1	21	1	10	3	13	3	10	3	10

NOTE.—No provision for interchanging Station at Lahore.

# APPENDIX F. Form I.

## PUNJAB NORTHERN (STATE) RAILWAY.

### LIST OF STATION BUILDINGS.

Name of Station.	PASSENGER BUILDING.		GOODS-SHEDS.			ENGINE-SHED.			POINTSMEN'S HUTS.		LATRINES.	
	No. of units.	Area in squares.	Length.	Breadth.	Area.	Length.	Breadth.	Area, squares.	No.	Area for one.	No. of units.	Area.
Shahdara	2	588	Feet.	Feet.	...	Feet.	Feet.	...	2	18	6	160
Moridki	1	288	...	...	...	...	...	...	2	18	6	160
Kamoki	1	288	...	...	...	...	...	...	2	18	6	160
Gujranwala	2	588	...	...	...	...	...	...	2	18	8	213
Gakkhar	1	288	...	...	...	...	...	...	2	18	6	160
Wazirabad	2	588	...	...	...	...	...	...	2	18	8	213
Gujrat	1	288	...	...	...	...	...	...	2	18	6	160
Lala Musa	1	288	...	...	...	...	...	...	2	18	6	160
Kharian	1	288	...	...	...	...	...	...	2	18	6	160
Jhelum	5	1,440	66	26	1,716	100	26	2,600	2	18	16	393
Total	17	4,932	...	...	1,716	...	...	2,600	20	360	74	1,939
Average per 100 miles of Railway	16½	4,789	...	...	1,666	...	...	2,524	20	349	72	1,882

# **APPENDIX F.** **Form J.** **PUNJAB NORTHERN (STATE) RAILWAY.** **LIST OF STAFF QUARTERS.**

Name of Station.		ENGINEERS' BUNGALOWS.		SUBORDINATES' BUNGALOWS.		OFFICES.		HOSPITALS AND DISPENSARIES.	
		Number of units.	Area, squares.	Number of units.	Area, squares.	Number of units.	Area, squares.	Number of units.	Area, squares.
Lahore and Sháhdarah	...	5	110.58	20	302.70	5	85.64	..	49.00
Kála	...	1	24.00	..	..	..	..	..	..
Sádhoki	...	...	...	1	24.00	..	..	..	..
Dillánwálah	...	...	...	1	24.00	..	..	..	..
Gujránwálah	...	1	32.00	..	..	..	..	..	..
Gakkhar	...	...	...	1	24.00	..	..	..	..
Wazírábád	...	1	34.80	10	129.40	..	..	..	..
Kuthála	...	4	109.16	10	122.28	1	47.00	..	26.10
Gujrát	...	1	13.50	..	..	1	4.50	..	..
Bhumbar	...	...	...	1	4.69	..	..	..	..
Kairah	...	1	10.91	..	..	..	..	..	..
Banni	...	1	17.73	5	33.38	..	..	..	..
Kamála	...	...	...	1	4.44	..	..	..	..
Jhelum	...	2	62.68	8	125.58	1	18.60	..	57.80
Naurangábád	...	1	21.28	3	53.66	1	17.67	..	28.64
Total	...	18	436.64	61	848.13	9	173.41	..	161.54
Average cost per square of building	...	Re 109		Re 88		Re 231		Re 103	

C. POLLARD, LIEUT.-COLONEL, R. E.,  
*Engineer-in-Chief Punjab Northern (State) Railway.*

# APPENDIX F.

## Form M.

### PUNJAB NORTHERN (STATE) RAILWAY.

#### ABSTRACT LIST OF ESTABLISHMENT.

Class of Officers.	No.	AVERAGE RATE OF			Total cost per annum.	Number of years.	Total for completion of the Railway.	AVERAGE COST PER 100 MILES.	
		Pay.	Allowance.	Total.				Per annum.	Total.
		Rs.	Rs.	Rs.	Rs.				
Engineer-in-Chief ... ..	1	2,000	169	2,169	26,028				
Superintending Engineer ... ..	1	1,100	103	1,203	14,436				
Superintendents of Works ... ..	2	2,200	94	2,294	27,528				
Executive Engineers 1st grade ... ..	2	1,900	31	1,931	23,172				
Ditto 2nd do. ... ..	2	1,600	21	1,621	19,452				
Ditto 3rd do. ... ..	4	2,600	227	2,827	33,924				
Ditto 4th do. ... ..	2	1,100	57	1,157	13,884				
Assistant Engineers 1st do. ... ..	7	3,150	284	3,434	41,208				
Ditto 2nd do. ... ..	6	2,100	189	2,289	27,468				
Engineer Apprentice ... ..	1	100	8	108	1,296				
Sub-Engineers 1st grade ... ..	6	2,550	112	2,662	31,944				
Ditto 2nd do. ... ..	5	1,700	172	1,872	22,464				
Ditto 3rd do. ... ..	3	780	104	884	10,608				
Supervisors 1st do. ... ..	8	1,600	212	1,812	21,744				
Ditto 2nd do. ... ..	11	1,650	231	1,881	22,572				
Overseers 1st do. ... ..	12	1,260	186	1,446	17,352				
Ditto 2nd do. ... ..	1	80	18	98	1,176				
Ditto 3rd do. ... ..	3	180	42	222	2,664				
Sub-Overseers 1st do. ... ..	5	250	44	294	3,528				
Ditto 2nd do. ... ..	7	245	79	324	3,888				
Ditto 3rd do. ... ..	12	300	65	365	4,380				
Locomotive Fitters ... ..	2	300	29	329	3,948				
Engine Drivers, Carpenters, Smiths, &c. ... ..	23	603	...	603	7,236				
Daffádárs, Chaukidárs, &c. ... ..	126	758	1	759	9,108				
Deputy Controller ... ..	1	550	31	581	6,972				
Accountants 2nd grade ... ..	3	900	51	951	11,412				
Ditto 3rd do. ... ..	3	600	...	600	7,200				
Ditto 4th do. ... ..	11	1,100	18	1,118	13,416				
Clerks ... ..	69	4,675	77	4,752	57,024				
Draftsmen ... ..	11	770	11	781	9,372				
Munshís ... ..	12	383	3	386	4,632				
Cashiers ... ..	5	225	33	258	3,096				
Chaprásís ... ..	47	275	18	293	3,516				
Chief Store-keeper ... ..	1	500	10	510	6,120				
Store-keepers ... ..	4	1,150	103	1,253	15,036				
Sub-Store-keepers ... ..	11	770	134	904	10,848				
Civil Surgeons ... ..	2	150	3	153	1,836				
Apothecary ... ..	1	250	94	344	4,128				
Native Doctors ... ..	4	120	35	155	1,860				
Hospital Establishment ... ..	23	132	...	132	1,584				

# APPENDIX F.

## Form N.

### PUNJAB NORTHERN (STATE) RAILWAY.

#### ABSTRACT OF EXPENDITURE FOR THE YEAR ENDING MARCH 1874.

Head of Sub-head of Account.	Estimated amount.	Expenditure during the year.	Previously expended.	TOTAL EXPENDITURE TO DATE.		REMARKS.
				Amount.	Percentage to amount of estimates.	
Preliminary expenses ...	Rs 2,17,061	Rs 2,869	Rs 2,39,844	Rs 2,42,713	111.81	
Land ...	1,71,847	40,772	89,650	1,30,422	75.89	
Earth-work, &c. ...	3,82,659	21,383	2,61,385	2,82,768	73.89	
Minor bridges and culverts ...	2,00,390	8,454	2,19,689	2,28,143	112.85	
Large bridges ...	98,20,126	11,95,735	32,33,344	44,29,079	45.10	
Tunnels.						
Level crossings, &c. ...	4,892	90	1,546	1,636	33.44	
Fencing ...	32,401	785	2,617	3,402	10.59	
Ballast ...	3,48,256	30,299	2,18,702	2,49,001	71.49	
Sleepers ...	8,04,870	25,273	4,85,985	5,11,258	63.52	
Rails and fastenings, &c. ...	16,48,101	10,14,117	1,71,813	11,85,930	71.95	
Stations ...	2,08,320	37,465	94,637	1,32,102	63.42	
Workshops ...	22,538	1,588	16,299	17,887	79.36	
Staff quarters ...	1,57,284	6,766	1,34,062	1,40,828	89.53	
Station machinery ...	1,24,784	25,873	29,124	54,997	44.07	
Electric Telegraph.						
Plant ...	12,61,725	2,18,264	9,28,137	11,46,401	90.85	
Rolling-stock ...	2,19,783	41,339	32,547	73,886	33.61	
Establishment ...	23,38,992	5,00,211	20,37,201	25,37,412	155.24	
Contingencies ...		16,353	77,444	93,797		
Suspense accounts ...		6,64,350	28,63,436	21,99,086		
Total	1,79,64,027	25,23,286	1,11,37,462	1,36,60,748	76.04	

F. BARNES,  
Deputy Controller Punjab Northern (State) Railway.

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ANNUAL  
PROGRESS REPORT  
OF  
PUBLIC WORKS IN PUNJAB,  
FOR THE YEAR  
1874-75.



LAHORE:  
PUBLIC WORKS DEPARTMENT PRESS.  
1875.

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## Note to accompany Annual Progress Report of Public Works in Punjab, 1874-75.

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The Progress Report embraces Imperial, Provincial and Local Works under the Punjab Government, including the separate Report by the Officers of the Irrigation Branch ; and is accompanied by the Railway Reports furnished by the Consulting Engineer for Guaranteed Railways, the Engineers-in-Chief of the *Punjab Northern* and *Indus Valley* State Railways, and the Manager of the *Rájputana* Railway.

2. Of these three State Railways, the first (Lahore to Pesháwar) is altogether within Punjab territory ; the second (Mooltan to Kotree) is partly within the Punjab, and then passes through the Baháwalpur State into Sindh ; and the third runs through two of the Punjab Districts for about fifty miles of its course after leaving Delhi. Of the Punjab Northern Railway the temporary narrow-gauge line on the Trunk Road is open from Lahore to Wazirabad. The Indus Valley Railway is not open for traffic. The open section of the Rájputana line includes the whole of the length within Punjab territory.

3. The works now reckoned Imperial, which are carried out under the direction of the Provincial Government, and for which specific allotments of funds continue to be made by the Government of India, include certain Military buildings, and the buildings for the Post Office and Telegraph Departments ; also the works of the Irrigation Branch, which has a separate Provincial Establishment.

4. The majority of the Military Works, formerly under the Provincial Public Works Officers, are under the immediate direction of the Government of India, and have a separate establishment, which is Imperial. Of the progress of these works the Punjab Government receives no report. The Military Works belonging to the stations of the Punjab Frontier Force, and to certain other stations mentioned in the Report, remain under the Provincial Government.

5. Works executed from the *Provincial Fund* and the *General Local Fund* are under the direct management of the Provincial Public Works Officers, but some of them are executed by Civil Officers, in particular cases where this is found desirable. Local works executed from *District* and *Municipal* Funds are under the management of the District and Municipal Committees, subject to the rules laid down by the Local Government. The designs and estimates for all District works costing Rs 1,200 each and upwards are examined by the Public Works Officers, who also undertake, with the sanction of Government, the execution of such works as the Committees desire to entrust to their supervision ; but District works generally are carried out by the District Committees' own agency. A few important Municipal works also are taken in hand by the Public Works Officers. The two principal Municipalities, Lahore and Delhi, have their own Engineers.

6. The Punjab Budget of *Cantonment Funds*, hitherto prepared in the Public Works Department, is now to be in charge of the Military Department,

for which Department in this Province there is a separate branch of the Government Secretariat. The works are ordinarily carried out by the Cantonment Committees with their own establishments, and with occasional aid, when necessary, from the Executive Engineers. Some small money assistance from Provincial Funds is given in certain special instances, to supplement deficient Cantonment income.

7. The repairs of some of the Frontier Outposts garrisoned by the troops of the Punjab Frontier Force and Frontier Militia, and some of the repairs of the roads connecting these Outposts, are carried out by the Military Officers. The Forts and Outposts on the western frontier of the Pesháwar District are garrisoned by the regular troops under the Commander-in-Chief, and belong to the Pesháwar Divisional command,—the works being under charge of the Officers of the Military Works Branch. The Military roads to these Forts and to the temporary convalescent station of Cherat on the Khattak hills remain under charge of the Provincial Public Works Officers, being maintained from Provincial Funds.

8. The buildings for the accommodation of the Native Troops of the Frontier Force were, till within the last few years, constructed, as elsewhere, by the men themselves, who received hutting allowance for the purpose, and, on change of station, sold their lines to the relieving Regiment. In accordance with the recommendation of Sir Neville Chamberlain, when commanding the Frontier Force, lines were built experimentally by the Government for certain Regiments, giving the required accommodation in the form of barracks. Subsequently the arrangement was authorized for other Regiments when it became necessary to renew existing lines, or to build lines in new places. Quarters for the married men have now also, in some instances, been built by Government.

9. The arrangements for the protection of the Cantonment of Dera Ismail Khan from the encroachments of the Indus have been reported in previous years. It has been necessary to continue them during the past year. And since the close of the year the river has continued, during the flood season, to cut in on the bank, turning the flank of some of the protective spurs, and now requiring further works of similar kind to defend the present bank and to divert the river from it.

10. The movements of such rivers, and their effects, often vary much from year to year, by deviations from the previous course of the main stream, as well as by variations in the height and time of floods. The injuries sustained at Dera Ismail Khan are due to the westward action of the main stream, not to overflow. While a little further down, the river rises above the opposite bank, and inundates large tracts in the District of Muzaffargarh; requiring the construction of an extensive embankment (which has been in great part completed and has acted well) for the protection of the lands, and the security of the revenue. This embankment is in the hands of the Officers of the Irrigation Branch.

11. The general tendency of the Punjab rivers, in their southerly course, may be said to be towards the west. But there is not a regular annual westerly action. At Dera Ismail Khan, where the city and cantonment are now very near the river, it has been necessary to check the tendency to advance on the west or right bank, and to encourage the main stream to follow the more easterly channels as well as to directly shield the bank. The attainment of this object in 1862 was assisted, at least, if not altogether effected, by the works executed with this view.

But since that time the river has been again working its way westward and calling for renewed efforts to divert it from the city and station. The expenditure on these protective works up to the present time has been nearly Rs. 1,25,000.

12. The rises of the Indus, from snow-melting and from rains, have varied considerably in different years. There is generally, after the first rise from snow, a slight fall previous to the great rise from the periodical rains. This year, the long time during which the river remained low caused some apprehensions of an obstruction in the upper course of the Indus or one of its chief tributaries, such as has occurred on a few memorable occasions in past years, when the bursting of the obstruction caused disastrous floods; and the people living near the river bank in the neighbourhood of Attock (where the contracted channel causes the highest rise) began to remove to safer positions. The long time of low water this year, however, appears to have been due only to the small snowfall last winter. The height of the Indus is registered daily at the Attock river-gauge.

13. The varying extent and duration of the floods affects generally within narrow limits only, on each river, the time of setting up and taking down the boat-bridges, but the times differ on different rivers, as the rise and fall at the bridge site is slow or rapid. The boat-bridges are ordinarily open for traffic from seven to eight months in each year. The boat-bridge on the Ravi at Shahdara (Lahore) is kept up throughout the year, though it is liable to be temporarily removed in exceptional floods. During the present season (since the close of the year to which the present report belongs) it was carried away by the unusual and continued pressure of high floods. The boats and superstructure were recovered, some of them after being swept down the river to a distance of six miles, and the bridge was re-constructed seven days after the subsidence of the flood.

14. The Sutlej boat-bridge at Phillour ceased to be maintained when the railway communication was complete. It was re-established last year for the march of troops, and was kept up during the cold season. The amount of traffic, notwithstanding the railway, has justified the maintenance of the boat-bridge for general use; and it is now proposed similarly to restore the boat-bridge communication across the Beas on the Trunk Road between Jullundur and Amritsar. Neither of the railway bridges across these rivers has a roadway for common traffic.

15. The following figures show the income, compared with the outlay on maintenance, of the three boat-bridges and ferries alongside of the railway bridges over the Jumna, the Sutlej and the Beas—

	1873-74.		1874-75.	
	Outlay.	Income.	Outlay.	Income.
	Rs.	Rs.	Rs.	Rs.
Jumna (Rājghāt) ... ..	847	3,572	847	3,080
Sutlej (Phillour) ... ..	16,985	21,642	9,604	10,247
Beas (Wazīr Bhullar, ferry only) ...	5,094	5,786	2,526	5,543

16. The Indus Steam Flotilla, plying between Mooltan and Kotree, in connection with the Sindh, Punjab and Delhi Railway, carried during 1874 (as shown by the return prepared in the Office of the Consulting Engineer) 16,779 tons of goods up the river, and 16,829 down; the total value being Rs. 2,63,36,877, and the freight Rs. 7,76,329.

17. Besides the works for the protection of Dera Ismail Khan, the river works of a generally similar kind on the Ravi at the town of Dera Baba Nanak,

of which some account was given in the last Annual Report, have been continued during the past year with much success. In addition to the protective spurs thrown out from the left bank, on which the town stands, cuts were made from a point on the opposite bank a little above the town to another a little below it, across the land within a wide bend of the river, with guiding spurs at the head of the cuts ; and, as desired, a great part of the stream has taken this course, to the relief of the bank in front of the town.

18. The only other river action of importance which has required attention has been the cutting of the left bank of the Sutlej opposite Ferozepore, which went on to a small extent during the past year, and has continued since. It has not been thought necessary to undertake remedial works of any kind at present. The loss of several hundred yards of road embankment, which extends the width of river bed to be crossed, has been the principal damage.

19. The road communications throughout the Province generally have been improved and extended. Several District roads are being metalled, under the direction of the District Committees.

20. The tolls on certain roads in the Delhi Division have been abolished. There remain now no tolls on roads in the plains. Tolls are maintained on the hill roads between Kalka and Simla, and between Ráwalpindi and Murree. The toll income of the Simla road last year was Rs. 25,758. The outlay on ordinary and special repairs was Rs. 23,626. And a sum of Rs. 3,124 was expended on the metalling of certain parts. The Murree road affords a toll income less remunerative at present, but valuable, and increasing. It amounted last year to Rs. 8,600. The outlay on ordinary and special repairs was Rs. 12,003, and on metalling Rs. 4,520. This road is now metalled all the way from Ráwalpindi to Murree. The principal station roads of Murree also are now metalled. The soil is mostly a tenacious red clay, retentive of water and very inconvenient in wet weather ; and the hard metalled surface has been an improvement of great public benefit.

21. In connection with the communications, attention has been given to the improvement of the accommodation for travellers, and for Government Officers of the several Departments. New rules for the management of dák bungalows and for improvement of their internal arrangements were introduced last year, and rewards are to be given for the encouragement of the responsible servants who are most successful in keeping their bungalows in good order. The control of all the arrangements connected with travellers' bungalows, and with sarais, except those belonging to the construction and repair of the buildings, has been transferred to the Civil Department. All the principal sarais have rooms for European travellers, and rooms specially constructed for native travellers of the higher classes. Some sarais have been constructed by wealthy natives at their own cost.

22. The provision of suitable rest-houses for the Civil Officers—District, Police, and others—is an important aid to the performance of their duties, and arrangements are being made for the systematic provision of this accommodation throughout the Province, for improved convenience of new buildings of this kind, and for rendering both new and existing rest-houses available, so far as this can be arranged, for the Officers of different Departments, instead of having separate rest-houses in the same place or in places near each other.

• 23. The chief new work belonging to communications with Native States which has been in progress during the past year is the continuation of the Ladakh road. Improvement has been made of the line from the Tsarap river to the Láchalang Pass, together with widening of the road for mule traffic. This work is being continued during the present year. It is in the territory of the Mahárájah of Kashmir, and is being carried out by a Public Works Officer in communication with the British Joint-Commissioner in Ladakh. The Engineer is also superintending the erection of the monument at Leh over the remains of Dr. Stoliczka who died on his return from Yárkand with the British Mission in June 1874.

24. A metalled road is being made from the Kartárpur railway station to Kapurthala. The portion within Kapurthala territory had been already made and metalled.

25. The Tibet road, in the valley of the Sutlej, has been only kept in repair, and received some slight improvements. Some very desirable larger improvements have been unavoidably deferred.

26. In the class of Civil Buildings the only large works in progress during the past year have been the Lahore College, and the District Court-house at Amritsar. The rest have been works of the ordinary kinds for the Land Revenue, Jail, and Police Departments. It has been necessary to defer the erection of the building for the Medical School at Lahore, which His Honor the Lieutenant Governor has for a long time been anxious to see provided. And now the serious losses which have occurred since the close of the year under review, from the unusual floods of the present season, particularly the extensive destruction of Jail buildings in several places, make unexpected demands for expenditure under this head.

27. For the ordinary Revenue and Police buildings of generally uniform character and requirements, new general or standard plans have been prepared, with all essential details, by the Assistant Secretary in the Public Works Department, in communication with the Heads of the Revenue and Police Departments. Several of these new general plans with specifications and detailed measurements and estimates of quantities have now been issued for adoption or guidance.

28. The following figures show the distribution of the outlay on Imperial and Provincial Works during the past year, under the principal Budget heads of service :—

				<i>Original Works.</i>	<i>Repairs.</i>	<i>Total.</i>
				<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
<b>IMPERIAL.</b>						
Military	...	...	...	1,04,181	78,578	1,77,704
Civil (Post Office and Telegraph)	...	...	...	20,850	11,570	32,420
Total Imperial				...	...	2,10,124
<b>PROVINCIAL.</b>						
<i>Civil Buildings.</i>						
Land Revenue	...	...	...	18,877	26,131	40,008
Jails	...	...	...	2,32,644	32,700	2,65,344
Police	...	...	...	1,36,333	45,524	1,81,857
Educational	...	...	...	1,16,651	16,141	1,32,792
General	...	...	...	2,08,607	43,380	2,51,987
Total Civil Buildings				...	...	8,71,988
<i>Communications</i>				5,40,881	10,04,772	15,45,653
<i>Miscellaneous Public Improvements</i>				1,47,217	83,572	2,30,789
Total Provincial				...	...	26,48,430

29. Eighty-two major works of all classes were completed during the past year, 1874-75. The total amount of the original estimates for these works was Rs. 4,35,914. The total amount of the sanction of the estimates, original and revised, was Rs. 4,57,006. The total actual cost was Rs. 4,51,262, an excess of Rs. 15,348 over the original estimates, and a saving on the estimates as finally sanctioned of Rs. 5,744.

30. The explorations of ancient buildings, by a Company of Sappers, whose services have been annually placed at the disposal of this Government by His Excellency the Commander-in-Chief for some years past for this purpose, were last season carried on at two places in the immediate neighbourhood of Pesháwar : first at *Shah-ji-ki-dheri*, about a mile to the east of the city, the presumed site of the great Tope of Kanishka, erected about the beginning of the Christian era, and specially noticed by the Chinese Buddhist pilgrims who visited India in the 5th and 7th centuries ; and then at *Takál*, three miles west of the Pesháwar Cantonment, from which place some of the best of the Indo-Greek sculptures have been obtained in past years. No discoveries of apparent importance have resulted from the exploration of the former of the two sites. The connection of the fragments of old walls and the plan of the former buildings have not been determined from the examination so far as it has gone. At *Takál* the results are more promising. The old buildings are being exposed in connected forms exhibiting the general plan and arrangement in detail. The work, which was stopped by the fire in the city of Pesháwar in May, which required the services of the Sappers, and then by the advancing heat of the weather, will be resumed.

31. The lists of objects of antiquarian interest in each District of the Punjab and in the adjoining Native States, which have been compiled at different times during some years past, and the completion of which has from various causes been delayed, have now been issued in a collected form with a Circular for guidance in preparing materials for a new, more correct and complete list.

R. MACLAGAN, MAJOR-GENERAL,

*Secretary to Government Punjab,*

*Public Works Department.*

*Dated 5th October 1875.*

PROGRESS REPORT  
OF  
PUBLIC WORKS IN PUNJAB,  
FOR THE YEAR 1874-75.

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PART I.—IMPERIAL.

Military.

The Imperial Works dealt with in this Report are the Military Works which, under special circumstances, remain in the hands of the Local Government ; and the Civil buildings of the Post Office and Telegraph Departments.

MILITARY.  
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2. As was noted in the Report for the previous year, the Military Works under the Punjab Government are limited to those belonging to the stations of the Punjab Frontier Force from *Hazdra* to the *Lower Derajat*, and to two other stations within the Province occupied by native troops. Also the Cattle Farm buildings at *Hissar*.

3. At *Jhelum*, re-metalling of the Cantonment roads has been in progress. An armorer's shop in the Native Infantry Lines was completed. The wells, water-courses and drains in the lines were cleared out and put in order. Jhelum.

4. At the Cantonment of *Talagang* a *pacca ghát* was added to the bathing tank in the Native Infantry Lines. The Rifle-Range was extended. The maintenance of the plantations of trees in the Cantonment was attended to. Talagang.

5. A new Rifle-Range at *Abbottabad* was commenced late in the year as soon as arrangements had been made for the requisite funds. Sufficient progress was made to enable one of the Native Infantry Regiments to make use of it in the beginning of April. An improvement was made of the drainage of the general parade-ground. Abbottabad.

6. Satisfactory progress was made with the extension of the water-supply works for the station of *Kohát*. The water is conveyed by a wrought-iron syphon to the Cavalry Lines, and the tanks, &c., in the lines have been opened. An old duct through the city nallah was stopped, and the new supply is believed to be free from contamination. Two of the supply-tanks have been roofed with Sindh tiles. The roofing of the remaining tanks remains to be done, and the introduction of glazed pipes to the duct at certain doubtful points. Kohát.

## MILITARY.

## Kohát.

7. The re-roofing of the station hospital at *Kohát* was completed. A new building, comprising quarter-guard, cells and store-room, in the Right Native Infantry Lines, *Kohát*, was also completed.

8. Two magazines on the standard plan, one in the Centre and the other in the Left Native Infantry Lines, *Kohát*, were completed. The roofing of the Left Infantry Lines was re-laid.

9. Extensive repairs were carried out on the Fort of *Bahádur Khel*.

## Bannu.

10. The Fortified Post at Barganattú, in the *Bannu* District, a substantial work in an advanced position, in substitution for the old Fort east of the Bannu and Kohát Road, was brought to completion.

11. Improvements were effected to the barracks within *Fort Dalépgarh* at Bannu. The walls of the Fort, which had sustained much damage in the heavy rains, were repaired.

12. A well, 160 feet deep, for the supply of water to the Cavalry and Artillery Lines at *Edwardes-abad* (Bannu), was completed, and fitted with a platform, cover and tank.

13. The re-construction of the Artillery Lines at *Edwardes-abad* was finished. A magazine and store-room for these lines was also constructed.

14. A quarter-guard and magazine for the Native Cavalry Lines at *Edwardes-abad* was finished. Armorers' shops were provided in several of the lines.

15. A new double Rifle-Range at *Edwardes-abad* commenced.

## Dera Ismail Khan.

16. Considerable outlay has had to be incurred again in the construction of spurs, thrown out from the right bank of the Indus, for the protection of the Cantonment of *Dera Ismail Khan*. Eight tree-spurs and two fascine-spurs were constructed with satisfactory results; much still remains to be done this year.

17. Louvres are being fixed in the verandah openings of the European barracks and hospital in *Fort Akálgarh*. Twenty of the louvres were made up before the close of the year.

## Dera Gházi Khan.

18. The re-roofing of the buildings in the Right Native Infantry Lines at *Dera Gházi Khan* was in progress.

19. The boring in the bottom of the old well at *Sabzalkot* has been resumed (Annual Report, 1873-74, para. 14). The boring machinery was cleaned and put into proper order, and 25 feet of the well were re-lined. Owing to the great demands



## MILITARY.

on the funds provided from the Imperial Treasury for Military Works, a grant was made for this work from the General Local Fund.

Dera Gházi Khan.

20. A half-company barrack for detachment of Native Infantry at *Rájanpur* was completed and made over for occupation. *Rájanpur.*

21. The usual repairs to the Frontier Posts and Rest-houses in the *Dera Ismail Khan*, *Dera Gházi Khan* and *Rájanpur* Districts were carried out. *Deraját.*

22. Besides the works above mentioned, minor works were executed, together with the usual repair and maintenance of existing buildings and outposts.

## Civil Buildings.

## POST OFFICES.

23. The Post Office building at Sirhind, in the *Umballa* District, was completed and handed over to the Postal Authorities. *Umballa.*

24. A tank for the storage of water was constructed in the Post Office compound at *Kalka*. *Simla.*

25. The Post Office at *Kasauli* was enlarged ; and a site cleared and foundations laid for a Bullock Train godown.

26. The new Post Office at *Gurdáspur* was completed. *Gurdáspur.*

27. Additional stables were provided for the Post Office at *Amritsar*. *Amritsar.*

28. A new Post Office was built at *Kohát*, with quarters for the Post Master. *Kohát.*

29. And a similar building at *Edwardes-abad*. *Edwardes-abad.*

## TELEGRAPH.

30. The north-west corner of the Telegraph Office at *Simla*, the ground under which showed signs of slipping, was supported by a heavy retaining wall. The building and out-offices were repaired. *Simla.*

31. The Telegraph Office at *Jhelum* was enlarged. *Jhelum.*

32. A bath-room and two out-offices were added to the Telegraph Office at *Murree*. *Murree.*

33. The new Telegraph Office at *Dera Gházi Khan*, commenced in the previous year, was completed. *Dera Gházi Khan.*

## PART II.—PROVINCIAL.

## Civil Buildings.

## BUILDINGS.

## LAND REVENUE.

Gurgáon.

34. Additional accommodation was provided for the Settlement Office at Nuh, in the *Gurgáon* District.

Hissár.

35. Additions and alterations were in course of execution to the Commissioner's court-house at *Hissár*.

Umballa.

36. A kacheri for the Assistant Commissioner at Rúpar, in the *Umballa* District, was under construction by the Officers of the Sirhind Canal. The well and out-offices also were in progress. Sheds for suitors were provided near the kacheri at *Umballa*.

Jullundur.

37. Court-house accommodation was provided at Nawashahr, in the *Jullundur* District, for the Extra Assistant Commissioner.

Hoshiárpur.

38. An additional large room was provided for the Deputy Commissioner's court-house at *Hoshiárpur*, and two record-rooms with racks were also added.

Kángra.

39. The combined tahsíl and thánah at Dera, in the *Kángra* District, with cattle-pound attached, were completed and made over to the Civil Authorities.

Amritsar.

40. Progress was made with the new court-house for Deputy Commissioner at *Amritsar*. Two wings of the court-house were roofed in, and the superstructure of the main front completed up to level of roof.

Lahore.

41. The building occupied by the Financial Commissioner's Office at *Lahore* was enlarged, and otherwise improved.

42. A "málkhánah" of four rooms was provided for the Deputy Commissioner's court-house at *Lahore*, and the roads in the court-house compound were metalled.

Gujránwála.

43. Certain improvements were effected to the existing tahsíl building at *Gujránwála*.

Mooltan.

44. A building at *Mooltan*, known as the "Shísh Mahal," included within the area formerly taken up for the proposed new Fort, was taken over from the Military Works Branch at a valuation for use as a court-house and office for the Commissioner.

Muzaffargarh.

45. A Settlement Department kacheri was built near the tahsíl at Alípur, in the *Muzaffargarh* District.

## BUILDINGS.

46. Work was commenced on an enlargement of the Deputy Commissioner's court-house at *Dera Gházi Khan*; the foundations and plinth of the new work were completed, and the superstructure was in progress. A new lock-up near the court-house was also in hand and made good progress.

Dera Gházi Khan.

47. The well in compound of Deputy Commissioner's court-house at *Edwardes-abad*, about 160 feet deep, was completed. Considerable repairs were carried out to the tahsíl and thánah at *Edwardes-abad*.

Bannu.

48. The buildings in the old station of Miánwáli, in the *Bannu* District, having been carried away by the Indus, a new site was selected further away from the river to the eastward of the village, and materials collected for a new court-house for the local Assistant Commissioner. A well was commenced and carried down to a depth of 22 feet.

49. Materials were collected for new tahsíl at *Talagang* and at *Fatahjang*, in the *Ráwalpindi* District. A new tahsíl at *Pindigheb* was nearly finished. A house at *Murree*, known as "Kirklands," was purchased for occupation as a Commissioner's court-house; and a new building for treasure-guard at the Assistant Commissioner's kacheri was completed.

Ráwalpindi.

50. Materials were collected for a tahsíl at *Abbott-abad*.

Hazára.

51. A house at *Pesháwar* was purchased to serve as a kacheri for the Commissioner; and a portion of the Residency building was converted into a Magistrates' court.

Pesháwar.

## SALT.

52. A house at *Mooltan* was taken over from the Military Works Branch at a valuation to serve as an office for the Collector of Customs.

Mooltan.

53. The works for protection of the Salt Department buildings and roads at the Mayo Mines at *Khewra*, in the Salt Range, were completed.

Salt Range, Jhelum District.

## JAILS.

54. In the *Karnál* jail, the block of ten solitary cells, commenced in the previous year, was completed. A paper-manufactory shed, and ward for civil prisoners, were also provided.

Karnál.

55. The foundations of ten new solitary cells in the *Rohtak* jail were completed, and the paper-manufactory in the jail was enlarged.

Rohtak.

## BUILDINGS.

- Sirsa.** 56. An office-room in the jail at *Sirsa* was nearly completed.
- Ludhiána.** 57. Some of the buildings in the jail at *Ludhiána*, including the weavers' shed and jailor's house, &c., were re-constructed and put in order.
- Jullundur.** 58. A manufactory godown was constructed in *Jullundur* jail.
- Kángra.** 59. A work-shed in the *Dharmśála* jail was commenced and nearly completed. Materials were collected for a block of solitary cells.
- Amritsar.** 60. Work was continued on the several buildings of the new jail at *Amritsar*. At the close of the year, six barracks, two godowns, jailor's house and four out-houses had been completed. New roofs were put on the female ward in the old jail.
- Sidálkot.** 61. The paper-manufactory sheds in the jail at *Sidálkot* were considerably enlarged and improved, and some solitary cells in progress were completed.
- Lahore.** 62. New quarters for European warders in the central jail at *Lahore* were commenced and nearly completed.  
63. Satisfactory progress was made with the conversion of the Gola Sarai at *Lahore* into a District jail, and the work was completed all except the enclosure wall and a few out-offices.  
64. The new Female Penitentiary at *Lahore* also made good progress. The roof-covering of hospital and reservoir and pipes for water-supply only remained to be constructed.
- Gujránwála.** 65. A block of 10 more solitary cells was constructed in the jail at *Gujránwála*; and the paper-manufactory shed in the jail was enlarged.
- Montgomery.** 66. Additions and alterations were effected to some of the buildings in the jail at *Montgomery*.
- Jhang.** 67. A block of 20 solitary cells in the jail at *Jhang* was in progress. The masonry of 16 of the cells was completed up to wall-plates. A new paper-manufactory shed was constructed, and several other improvements effected in the jail.
- Mooltan.** 68. The conversion of an old lock-up into 18 solitary cells in the jail at *Mooltan* was completed. Work was commenced on a new block of 40 additional solitary cells. The foundations of 10 of these were laid and materials collected for

## BUILDINGS.

the superstructure. A paper-manufactory shed was constructed, and a well provided to barracks Nos. 7 and 8. Some minor improvements also were effected to other buildings in the jail.

Mooltan.

69. The improvement and re-roofing of buildings in the jail at *Dera Ismail Khan*, commenced in the previous year, were brought to completion. An enlargement of the paper-manufactory was in progress, and some small additions carried out to other of the jail buildings.

Dera Ismail Khan.

70. Work was commenced on a block of 20 solitary cells for the jail at *Jhelum*. Additions were made to the paper-manufactory, the back walls of the paper and printing sheds were re-built, and other improvements in the jail effected.

Jhelum.

71. Twenty solitary cells were added to the *Shahpur* jail.

Shahpur.

72. Additions were made to the paper-manufactory in the *Rawalpindi* jail. The female ward was enlarged, and a large ward for juvenile prisoners completed. The outer walls of the quarantine wards and new solitary cells were improved and strengthened. A building for civil prisoners near the jail was completed.

Ráwalpindi.

73. The lock-up at Haripur, in the *Hazára* District, was extended on account of the increased number of prisoners requiring accommodation.

Hazára.

74. A new well in the jail at *Pesháwar* was nearly completed.

Pesháwar.

## POLICE.

75. A new municipal police station in the city of *Delhi* was commenced and nearly finished by the close of the year. The 1st class police station at Mahrauli in the *Delhi* District, commenced in the previous year, was completed. A police rest-house at Sonapat, in the same District, was constructed; and a set of barracks for the municipal police commenced.

Delhi.

76. The foundation and plinth of a 1st class police station at Hodal, in the *Gurgáon* District, were completed, and the building was in progress.

Gurgáon.

77. Materials were collected for a 1st class police station at *Karnál*, but the commencement of work was delayed owing to questions regarding the proper site for the building.

Karnál.

78. The new 1st class police station at *Sálhávás*, in the *Rohtak* District, was completed. A police hospital at *Rohtak* was commenced by the Deputy Commissioner and nearly finished.

Rohtak.

## BUILDINGS.

- Hissár.** 79. A 2nd class police station at *Khairi*, in the *Hissár* District, was constructed.
- Sirsa.** 80. Alterations were in progress to the police station at *Abohar*, in the *Sirsa* District.
- Umballa.** 81. The new police station at *Biláspur* and *Morinda*, in the *Umballa* District, were completed.
- Simla.** 82. The old *thánah* at *Kasauli*, being considered insufficient for its present requirements, was dismantled, and a new building commenced on its site.
- Ludhiána.** 83. A municipal police barrack was built at *Ludhiána*.
- Ferozepore.** 84. Three police rest-houses were in progress at *Nihál Singhwála*, *Mánwála* and *Bhagta*, in the *Ferozepore* District.
- Jullundur.** 85. A cook-house and enclosure-wall were provided for the Police Inspector's quarters at *Jullundur*; and a 1st class police station at *Nakodar*, in the *Jullundur* District, was completed.
- Hoshiárpur.** 86. The foundations were laid of a 1st class police station at *Anandpur*, in the *Hoshiárpur* District.
- Kángra.** 87. The 1st class police station at *Kángra*, commenced in the previous year, was finished. The 2nd class police station at *Dera*, in the *Kángra* District, was completed. Two other 1st class police stations in this district were in progress: one at *Hamárpur* was nearly finished, and one at *Pálampur* was carried up to level of wall-plates.
- Dalhousie.** 88. A house named "Rockcliffe," near the court-house at *Dalhousie*, was purchased to be used (with some alterations) as a police station.
- Siálkot.** 89. A police hospital was erected in the police lines at *Siálkot*, providing accommodation for 20 patients.
- Lahore.** 90. Four 2nd class police stations were built at *Ráewind*, *Kálrah*, *Valtoha* and *Khudián*, in the *Lahore* District.
- Gujránwála.** 91. A 1st class police station was constructed at *Kila Didár Singh*, in the *Gujránwála* District. Six 2nd class police outposts at various localities in this district were also erected.
- Montgomery.** 92. The police buildings at *Hujra* and *Jamlera*, in the *Montgomery* District, which remained unfinished in the previous year, were completed; and alterations were made to police lock-ups in the district.

## BUILDINGS.

93. A 1st class police station at Mailsi, in the *Mooltan* District, was completed. Mooltan.
94. The 1st class police station at Amín-ki-Garhi, in the *Bannu* District, was brought to completion. Materials were collected for a new thánah at Miánwáli. Bannu.
95. A 1st class police outpost at Ahmadabad, and a rest-house at Tamman, in the *Jhelum* District, were completed. Progress was made with a 1st class police station at *Talagang*. Jhelum.
96. A municipal police station was built at Hazro, in the *Ráwalpindi* District. Ráwalpindi.
97. At *Murree*, a verandah and cook-house were added to the building occupied by the police treasury guard. Murree.
98. A police office was built at *Abbott-abad*, on the standard plan. Abbott-abad.
99. A large reserve police barrack, on the standard plan, was built at *Kohát*; and a second class police outpost at Teri, in the *Kohát* District, was constructed. Kohát.
100. A police hospital, and a quarter-guard, were completed at *Pesháwar*. Two 1st class police stations, at Naushahra and Kátlang, in this District, were also finished. Pesháwar.

## EDUCATIONAL.

101. A new school was in progress at Najafgarh, in the *Delhi* District. Delhi.
102. The Gharounda school, in the *Karnál* District, was enlarged. Karnál.
103. Two new schools were built, and a third was in progress, in the *Rohtak* District. The Kalánaur, Jhajjar and Bádli schools were enlarged. Rohtak.
104. Two village schools were built in the *Hissár* District. Hissár.
105. A boarders' house was added to the zilah school at Jagádhri, in the *Umballa* District. Umballa.
106. A continuation was made of the trials for determining the quantity of rain-water obtainable from the shingle roofs of the buildings of the Lawrence Military Asylum at *Sanáwar*. It appeared that the quantity which could thus be Sanáwar.

## BUILDINGS.

- Sanáwar.* collected for use there is about 60 per cent. of the rain-fall. An experimental filter was provided in connection with the tank.
107. A range of out-offices was added to the boys' hospital at *Sanáwar*. Progress was made with a covered passage from the girls' barrack to the new school.
- Ludhiána.* 108. Progress was made with the construction of a High School at *Ludhiána*, to which a contribution was made by the Municipal Committee.
- Hoshiárpur.* 109. A room was added to the school-house at *Hoshiárpur*, and improvements to the Head Master's house were carried out. Nineteen new village schools were built in the *Hoshiárpur* District.
- Amritsar.* 110. Two village schools in the *Amritsar* District were built, and four others were in progress.
- Gurdáspur.* 111. The extension and alteration of the zilah school at *Gurdáspur*, amounting nearly to the construction of a new building, has been completed. Two new school-houses were constructed at *Bhám* and *Bhikariwál*, in the *Gurdáspur* District; and the *Dera Nanak* school was enlarged.
- Lahore.* 112. Satisfactory progress was made with the construction of the new College at *Lahore*. The superstructure of the building was carried up to 30 feet above level of lower floor. The lower storey was completed, and the upper about half built.
113. Materials were collected for the building for the Medical School at *Lahore*, the commencement of which it has been necessary to defer. Five new schools were in progress at different localities in the *Lahore* District.
- Gujránwála.* 114. A grant-in-aid was given from the Municipal funds towards the construction of a mission school at *Gujránwála*.
- Montgomery.* 115. The schools at *Pákattan* and *Hujra*, in the *Montgomery* District, were improved; and four new schools were constructed in other localities in the District.
- Jhang.* 116. The new Upper school between *Jhang* and *Maghiána* was completed; and the school at *Chiniot*, in the *Jhang* District, greatly improved.
- Mooltan.* 117. Ten new school-houses were constructed in the tahsils of *Mooltan*, *Mailsi*, *Shujábad* and *Sarai Sidhu*, in the *Mooltan* District.



## BUILDINGS.

118. The re-building of school at Khairpur, in the *Muzaffargarh* District, which had been damaged by the floods of the Indus, was in progress. Two wings were added to the school at *Khángarh*, in the same District. *Muzaffargarh.*

119. The additions to the zilah school at *Jhelum* were completed. *Jhelum.*

120. Four new schools were built in the *Ráwalpindi* District; and the school at Lodra, in that District, was enlarged. *Ráwalpindi.*

121. Several works and improvements of a minor character were carried out in connection with the Lawrence Asylum buildings at *Murree*. Roof-gutters and down-pipes have been attached to the buildings for collecting rain-water in barrels. *Murree.*

122. A kitchen has been built, at the girls' school-house, for instruction of the girls in cooking. A covered passage has been made to the girls' latrine. The boys' lavatory has been enlarged, and the boys' latrine re-constructed on a new site.

123. A new school was built at Mardán, in the *Pesháwar* District. *Pesháwar.*

## GENERAL.

124. New dispensaries were constructed at Sonapat and Farídabad, in the *Delhi* District. *Delhi.*

125. A building was in progress at *Gurgáon* for the accommodation of native gentlemen coming to the sadar station on business; the expenditure was met partly from District funds and partly from subscriptions. Shelter also was provided at three tahsils in this District for zamíndárs resorting to them. A new dispensary was in progress at *Gurgáon*. *Gurgáon.*

126. A new dispensary was under construction at Gohána, in the *Rohtak* District. *Rohtak.*

127. A female-ward and cook-room, and a dead-house, were added to the dispensary at *Hissár*. Cattle-pounds were constructed at Khot and Toshám, in this District. *Hissár.*

128. Rest-houses for Civil and Police Officers were in progress at Narel and Jamál, in the *Sirsa* District. *Sirsa.*

129. The substitution of a corrugated iron roof for slates on the church at *Simla* was in progress. The north side of the building was so re-roofed, and materials were prepared for the remainder of the work. The new porch to the church was completed. *Simla.*

## BUILDINGS.

- Ferozepore.** 130. Five cattle-pounds were built in the *Ferozepore* District.
- Jullundur.** 131. A new dispensary at *Jullundur* was nearly completed, from District and Municipal funds.
- Hoshiárpur.** 132. A new building for the Small Cause Court was erected at *Hoshiárpur*. The dispensary at *Una*, in the *Hoshiárpur* District, was completed and opened.
- Kángra.** 133. The alterations and additions to the *Dharmśála* church were finished ; and also the jhampán-shed near the church. A suitors' shed was constructed near the kacheri at *Dharmśála*, and a dead-house for police cases was in progress. The dispensary at *Sultánpur* in *Kullu*, was enlarged.
- Amritsar.** 134. A chaukidar's house was built in the church compound at *Amritsar*.
- Gurdáspur.** 135. The improvements to the *Gurdáspur* dispensary were completed ; and progress was made with three other dispensaries in this District.
- Dalhousie.** 136. Further progress was made with the new church at *Dalhousie*. The superstructure of the building was in hand.
- Siálkot.** 137. Materials were collected for a new dispensary at *Raya*, in the *Siálkot* District ; and a new well was provided for the *Siálkot* leper asylum. Houses were built for the trade registrars at *Zafarwál*, *Sálehpur* and *Dalowáli*, in this District.
- Lahore.** 138. Additions were made to the building occupied by the Chief Court at *Lahore*, and improved arrangements for cooling the court-rooms.
139. Additional rooms were built and some improvements made in the Government Secretariat buildings at *Lahore*. The inner verandahs of the Public Works Secretariat buildings were re-roofed.
140. Accommodation for the Currency Department at *Lahore* was added to the building occupied by the Office of the Accountant General, the rooms in the Deputy Commissioner's kacheri, formerly occupied by the Currency Office, to be made available for pleaders, &c.
141. Materials were collected for the re-construction of the roof of the "Montgomery Hall" at *Lahore*. Progress was made with certain improvements of the Mayo Hospital and its approaches. A room for *post-mortem* examinations was provided in the lunatic asylum.

## BUILDINGS.

142. Cattle-pounds at two police stations in the *Lahore* District, and four "patwárhánas" in various localities, were constructed. Lahore.
143. A new dispensary was in progress at Sanáwan, in the *Muzaffargarh* District. Muzaffargarh.
144. The construction of the new palace for His Highness the Nawáb of Baháwalpur was in progress under the direction of the Engineer deputed to that State. The main body of the building was finished up to the springing of arches, and one of the corner towers was completed. A new treasury guard was also finished. The station has been irrigated by a No. 10 Gwynne's pump worked by a 10 horse-power portable engine, the station gardens and the palace being supplied also. The cost of lifting water by this means was found to be one-fifth that of a Persian wheel. Good progress was made in casting and wrought iron work in the Baháwalpur workshops. The out-turn of wrought iron work was Rs. 8,640, and of castings Rs. 12,800. Twenty sets of waggon iron work and buffer gear were made up for the Indus Valley Railway. Three dredges were in use in the river and local canals and did much good work. Bahawalpur State.
145. The construction of a sessions-house at Tánk, in the *Dera Ismail Khan* District, was commenced. The foundation and plinth of the building were completed, and the superstructure carried up to two feet above plinth level. Dera Ismail Khan.
146. The enclosure-wall of the new cemetery at *Dera Ismail Khan* was completed, and the road-approach was in progress.
147. Some minor work was executed in the renewal of roof of *Jhelum* church. Jhelum.
148. Several dispensaries were built in the *Shahpur* District, in isolated localities. Shahpur.
149. The dispensary at Kahuta, in the *Ráwalpindi* District, was completed; and quarters for the Native Doctor were built in the dispensary at *Attock*. Female-wards were added to the dispensary at *Pindigheb* in this District. Ráwalpindi.
150. The enlargement of the new cemetery at *Murree* was brought to completion. Murree.
151. Out-offices and godowns were provided to the Civil Officers' rest and circuit-houses at Kálápáni, Bagnotar, and Natiágali, in the *Hazára* District. Hazára.

## COMMUNICATIONS.

## Communications.

## METALLED ROADS.

Delhi and Mathra  
Road.

152. The metalling of 19 miles of the *Delhi* and *Mathra* Road, from the *Okla* junction to *Kāli*, was continued, and a considerable amount of earth-work in berms, &c., carried out. The width of metal of the first  $4\frac{1}{2}$  miles of this road, from *Delhi*, was increased. Only a small amount of funds could be assigned to this work.

Delhi to Bahádur-  
garh.

153. The breadth of the road from *Delhi* to *Bahádurgarh* (to *Bohtak* and *Sirsa*) was increased. The work was completed during the year.

Delhi to Umballa  
and Lahore.

154. The Grand Trunk Road from *Delhi* to *Umballa*, and on through *Amritsar* to *Lahore*, was maintained in good order. On the section between *Shahabad* and *Phillour* there were some difficulties in the supply of kunkur for road-metal, ordinarily obtained within the territory of the *Mahárajah* of *Patiála*. Kunkur for some miles had to be obtained from a considerable distance.

Umballa to Jagádhri.

155. The usual petty repairs were effected to the road between *Umballa* and *Jagádhri*.

Umballa to Kalka.

156. The road from *Umballa* to *Kalka* was maintained in fair order. Metal along six miles was collected, and consolidation completed on four miles. The approach to the *Jhujra* crossing was in course of improvement. A pier of the *Láru* bridge was observed to have sunk, and some of the trussed beams having sagged, a diversion was made for the traffic during the repairs.

Ludhiána to Feroze-  
pore and Lahore.

157. On the road from *Ludhiána* to *Ferozepore* and thence to *Lahore*, special repairs were carried on on the section between *Ludhiána* and *Ferozepore*. Metal for 21 miles was collected, and the consolidation for nearly this whole length completed. The metalled crossing of the old *Sutlej* river bed, near *Ferozepore*, was maintained in as good repair as the heavy traffic on it would admit of. During the monsoon season the *River Sutlej* set against the left bank at *Rájghát*, near *Ferozepore*, and in a short time cut away about 1000 feet of the *Trunk Road*. Tree-spurs were constructed to prevent further damage. The metalling of several miles of the section between *Ferozepore* and *Lahore* was renewed, and the plantations of trees along the road attended to.

Jullundur to Hoshiár-  
pur and Dera.

158. New wells were provided for some of the road *chaukis* on the *Jullundur* and *Hoshiárpur* Road; the plantations along the road maintained; 25 miles of collection of metal and

## COMMUNICATIONS.

the same of consolidation completed; and several bridges repaired.

Jullundur to Hoshiarpur and Dera.

159. Metal was also collected and consolidated along 39 miles of the continuation of this road as far as *Dera en route to Dharmśāla*.

160. A commencement was made with the metalling of the road from the *Kapurthala* boundary to the *Kartárpur* railway station on the Punjab and Delhi Railway. Metal was collected along three miles of the road, and the earth-work completed.

Kapurthala to Kartárpur.

161. The metalled road from *Amritsar* to *Patháńkot* was maintained in good order, and new protective railings were provided on the embanked approaches to the *Parmánand* bridge.

Amritsar to Patháńkot.

162. A commencement was made of the metalling of the road from the Cantonment of *Siálkot* to the *Wazirabad* Station, on the line of the Punjab Northern Railway. Six miles of the road were metalled, and collection of metal completed for eight more miles.

Siálkot to Wazirabad.

163. The metalled road from *Mooltan* to the *Sher Shah* ferry on the *Chenab* was maintained in good order, but two miles of the road were flooded in June by a breakage in the *Sikandrabad* Canal, and metal for renewal of both miles was collected, and consolidation on one mile completed.

Mooltan to Sher Shah.

164. Metal was collected for parts of the road from the right bank of the *Chenab* at *Sher Shah* to *Muzaffargarh* and *Dera Gházi Khan*. Mile-posts were in course of erection all along the road.

Mooltan to Dera Gházi Khan.

165. The Grand Trunk Road from *Lahore*, as far as *Jhelum*, on which the narrow-gauge line of the Punjab Northern Railway is laid as far as *Wazirabad*, continued under charge of the Officers of the State Railway, an assignment being, as usual, made from Provincial Funds for its maintenance.

Lahore to Pesháwar.

166. On the section between *Jhelum* and *Ráwalpindi*, 68 miles, the ordinary repairs were executed. On 62 miles stone metal was collected and broken for a new layer, and on 21 miles the metal was consolidated. The low ground near the road, at the station of *Jhelum*, was drained.

167. Between *Ráwalpindi* and *Attock* the protective walling and railing at dangerous parts of the road was carried on, and the usual repairs to the road effected. From *Attock* to *Pesháwar* the consolidation of the second layer of metal was in progress, and half the work completed.

## COMMUNICATIONS.

Ráwalpindi to  
Murree,

168. The protective walling along the road from *Ráwalpindi* to *Murree* was completed, and the metalling of the road. Eighteen permanent bridges were substituted for the old temporary ones, and the usual repairs along the road were executed. A house at *Tret* was purchased for a Public Works rest-house, and put into repair. Improvements were made to the roads to the Kuldunna Cantonment, and to the *Flats*.

Kohát District.

169. The metalling of part of the *Kohát* and *Bannu* Road, from the *Kohát* Cantonment to the *River Tawi*, was completed.

Pesháwar District.

170. A commencement was made with the metalling of the road from *Pesháwar* to *Badábir*.

## UNMETALLED ROADS.

Kalka to Simla.

171. The road from *Kalka* to *Simla* was kept in good order, and wheeled traffic was maintained. The rainfall of the year was small. Progress was made with the metalling of certain parts of the road, and 23 drains, with an aggregate waterway of 70 running feet, were re-built. Some of these, from the nature of the ground, are of great depth and length.

172. Further progress was made with the blasting of the *Tára Devi* cliffs, and the work was about two-thirds completed.

173. Near the termination of the road at *Simla*, in the 56th mile, and below what is known as the "*Chaura Maidán*," a portion of the road, about 200 feet in length, sunk (about 10 feet at the middle) owing to the hillside being cut by the water on either side. The banks of these streams have been protected by dry-stone masonry walls and flooring.

174. On the old road from *Kalka* to *Simla* *viâ Kasauli*, a heavy slip took place in the 6th mile from *Kalka*, which occasioned considerable interruption of traffic. The slip was protected as much as possible by catch drains. The rest of the road was kept open and in good order throughout the year.

175. The branch roads to *Kasauli*, *Subáthu*, *Sandáwar* and *Dagshai* were maintained in fair order. Several drains and retaining walls on the *Kasauli Branch* were renewed.

176. The new inspection bungalow at *Dharmpur* was completed.

## COMMUNICATIONS.

177. The widening of miles 2, 3 and 4 of the *Hindustán and Tibet* Road, and the improvement of the old road from the 4th to the 9th mile, were completed. The branch road to *Mashobra* was improved and widened.

*Hindustán and Tibet  
Road.*

178. About six miles of the extension of the Tibet road towards *Kánam* were completed.

179. The whole length of road was maintained in good order, and kept open for traffic from April to December. A heavy flood in June nearly carried away the *Channa* bridge at the 102nd mile, the whole abutment built of dry-stone masonry bonded with timber being thrown over, and the superstructure much damaged.

180. The cantilevers of the *Wángtu* bridge (120 feet span) and the roadway have been strengthened.

181. The *Kángra Valley Road (Páthankot to Pálampur)* was completed and opened for cart traffic from *Patháankot* as far as the junction of the road leading to the *Channi* rifle-range and *Dharmadla*. Across the *Grail* and *Bhud* channels causeways are maintained in place of the proposed bridges. The roadway across the *Chakki* was demarcated with posts and kept as clear as practicable for wheeled traffic. A culvert over the *Chakwál* stream was constructed to replace one which had been carried away by floods.

*Kángra Valley.*

182. A considerable amount of work,—earth-work, blasting, culverts, syphons, drains, and minor bridges, retaining walls, and dry masonry irrigation drains,—was carried out on the part of the road between *Núrpur* and the *Chambi* river, and about six miles of new road were constructed. The temporary bridge over the *Kauli* river was also completed, and the approaches to the stream widened and improved. For about five miles of the road dry parapet walls were provided at the most precipitous places.

183. Work was commenced on the unfinished portion, about five miles between the *Chambi* river and *Gurkarri*, and the earth-work was nearly completed. A heavy revetment wall of dry masonry was finished at the approaches to the *Mánjhi* river. A considerable number of masonry bridges and culverts were finished and others were in progress, and dry masonry irrigation culverts to the extent of 15 per mile provided where necessary.

184. The *Bandarghát* incline was dressed and improved.

185. On the road from *Gurkarri* onwards to *Pálampur*, roadways across the beds of the nallahs have been substituted for the temporary wooden bridges, which had begun to decay.

## COMMUNICATIONS.

Kángra to Ladakh.

186. The continuation of the *Kángra Valley Road* through *Kullu* to *Koksar*, in *Láhul*, crossing the *Babbu* Pass in the *Mandi* territory, and the *Rohtang* Pass at the head of the *Kullu* Valley, has been kept in good order, and was accurately measured. The improvement of the road onwards through *Láhul* towards *Leh* made further progress; the gradients of the *Lácha Lang* Pass were improved with slight increase of length, and 13 miles of the trace of the new line within the territory of the *Mahárájah* of *Kashmir* were completed. Some houses of refuge were constructed.

Dharmśála to  
Hoshiárpur.

187. On the section of the *Dharmśála* and *Hoshiárpur* road, from *Dharmśála* as far as *Dera* on the *Beas*, a number of dry masonry parapet walls were constructed. The approaches to the *Chaitru* bridge were completed and the slopes grassed; the approaches to the temporary wire suspension bridge over the *Bánganga* below the *Fort of Kángra* were completed, and the bridge opened for traffic.

Patháńkot to  
Dalhousie.

188. The road from *Patháńkot* to *Dalhousie* was maintained in good order, several retaining walls were built, and side and cross drains constructed.

Siálkot to Gurdáspur.

189. The usual repairs were effected to the road from *Siálkot* to *Gurdáspur*, and the road maintained in fair order.

Lahore to Shahpur.

190. On the line of road from *Lahore* to *Shahpur*, as far as *Pindi Bhatián* on the *Chenab*, the usual repairs to the earth-work and metalled gaps were carried out, and the plantations of trees maintained.

Mooltan to Dera  
Gházi Khan.

191. The unmetalled portion of the road from *Mooltan* to *Dera Gházi Khan*, 26 miles, were grassed (covered with a thin layer of dry grass), and kept in good order for traffic. The construction of the road from *Dera Gházi Khan* to *Rájanpur* has been in progress under the Civil Officers.

Jhang to Bhakkar.

192. The road from the *Chíchawatni* Station, on the *Lahore* and *Mooltan* Railway, to *Jhang* and *Dera Ismail Khan*, was improved and grassed where necessary, and metalling of certain parts commenced. A metalled gap was constructed across a nallah in the *Jhang* District. The mail-cart now traverses the *Bár* tracts of the *Dera Ismail Khan* District from *Dera Ismail Khan* to *Chíchawatni*.

Dera Ismail Khan to  
Tánk.

193. Some progress was made with the improvement of the road from *Dera Ismail Khan* to *Tánk*.



## COMMUNICATIONS.

194. The improvement of three miles of the *Bannu* and *Dera Ismail Khan* Road through the *Peyzu* Pass was completed.

Bannu District.

195. Further protective parapets were made, partly of dry rubble walls and partly of large blocks of uncut stone, on parts of the road from *Murree* to *Abbottabad*. Some retaining walls on the road had to be re-built, and the approach to the right bank of the River Dhor was improved.

Murree to Abbottabad.

196. Massive block parapets have also been laid along parts of the roads from "Sunny Bank," Murree, towards Kashmir.

197. The roads of the *Hazara* Frontier were maintained in order.

Hazara District.

198. The roads in the *Kohat* District were kept in repair, and petty improvements carried out where necessary.

Kohat District.

199. In the *Peshawar* District the usual repairs to the *Dodba* Outpost roads, the *Naushahra* and *Mardan* road, and the road to *Kohat*, were carried out. The road between *Pabbi* and *Cherat* was repaired and improved.

Peshawar District.

## DISTRICT ROADS.

200. The earth-work was completed of a new unmetalled road between *Delhi* and *Najafgarh*; a few bridges and culverts remain to complete the work. The unmetalled road between *Rai* and *Sonepat* was completed, and it is proposed now to metal it, and to plant trees along it. A road was in progress between *Pattan* and *Najafgarh*; and a bridge was constructed on the new *Paimbári* road in the *Delhi* District.

Delhi District.

201. The causeway on the *Gurgaon* and *Sohna* road, at *Bádshahpur*, was improved by constructing an artificial rapid to prevent the stream from silting over the causeway; the bridges on the road were nearly completed; and two miles of the road were metalled. The metalling of the road between *Farukhnagar* and the adjoining Railway Station was in progress.

Gurgaon District.

202. Three miles of the metalling of the road from *Karnal* towards *Jagádhri* were completed. The *Lohári* road, in the *Karnal* District, was raised, and several small bridges on it were built. Five bridges were completed over the channel to the *Bidkedár* tank near *Kaithal*. Several bridges were under construction on the *Sutána* road.

Karnal District.

## COMMUNICATIONS.

## Rohtak District.

203. Two miles of the *Rohtak* and *Bhiwāni* road were nearly metalled ; and so also were detached portions, in bad and sandy soil, of the roads to *Jhajjar*, *Mahm* and *Gohana*, and to the Customs Line, in the *Rohtak* District. A drop-wall was constructed on the *Sālhāwās* road, and 11 bridges on various District roads ; and 10 bridges on these roads were enlarged.

## Hissār District.

204. Of the *Hissār* and *Fatahabad* road,  $3\frac{1}{2}$  miles were metalled ; and fourteen culverts were built on various roads in the *Hissār* District.

## Umballa District.

205. In the *Umballa* District a bridge was commenced over the Pandoa nallah, on the road between *Kharwan* and *Būriya* ; and a number of unmetalled roads were constructed at *Rūpar*.

## Ludhiāna District.

206. The metalling of the road from *Jamrāla* to *Māchiwāra*, in the *Ludhiāna* District, was in progress, two miles having been completed during the year.

207. Fresh coats of metal were given to the roads from *Ludhiāna* to *Samrāla* and *Dehlon*. The earth-work of the road from *Dhoka* to *Baekot* was completed, and metal was in course of collection. A portion of the road between the *Jagrāon* dispensary and the metalled road from the tahsīl to the town was metalled. A wooden bridge over the Budha nallah at *Māchiwāra* was completed, the townspeople and agriculturists having contributed materials.

## Ferozepore District.

208. The metalled road from the Kasūr gate of the town of *Ferozepore* to *Gholām Huseinwāla* was thoroughly renewed. Two district feeders of the Trunk Road in the *Ferozepore* District were improved by clearing away sand and embanking them with earth, and measures were taken to preserve them from sand-drifts. It is proposed gradually to improve other feeder roads in the District in a similar manner.

## Jullundur District.

209. The *Jullundur* and *Kapurthala* road, of which a little earth-work remained to be done, was completed ; compensation for land taken up was paid. Progress was continued on the *Jullundur* and *Nakodar* road, on which masses of sand were removed for a length of  $1\frac{1}{4}$  miles, two other miles being metalled. The roads from *Nakodar* to *Malsiān*, *Phillour* to *Lisārah* and *Nirmahal*, and *Garhshankar* to *Nawashahr*, were raised and levelled. In regard to the metalling of the road connecting the *Jullundur* and *Hoshiārpur* road with the *Jullundur* City Railway Station, it was arranged that, in the event of the extension of the station, the Railway Company will provide a level-crossing for the road. Half of

## COMMUNICATIONS.

the earth-work of the road was completed, a culvert constructed, and metal collected. The important road from *Jullundur* to *Tānda*, leading into the *Hoshiārpur* and *Gurdāspur* Districts, was raised and levelled.

210. Materials were collected for a bridge over the *Beyn* river, on the *Garhshankar* and *Nawashahr* road.

211. A new road was opened between *Amb* and *Koloh*, connecting *Hoshiārpur* with *Mandi*, *Suket* and other Hill States. Two roads of less importance, but much appreciated by the people of the neighbourhood, and by pilgrims to *Jawala-mukhi* and *Chintpurni*, were in progress.

212. A bridge over the *Sutlej* at *Rāmpur*, in the *Kāngra* District, was in progress.

213. The roads from *Hoshiārpur* to *Una* and *Rūpar* were greatly improved. Another road from *Hoshiārpur* joining the Trunk Road at *Phagwāra* was also put in order.

214. A new unmetalled road was in course of construction between *Majitha* and *Kathunangal*. Ten drain bridges, eleven metalled gaps, and thirteen culverts were constructed on other roads in the *Amritsar* District.

215. The metalling of the *Naushahra* and *Trimmu* road, in the *Gurdāspur* District, was continued; a portion of the *Gurdāspur* and *Kalānaur* road, passing through sand, was metalled; and the road from *Toghlawāla* to *Srīgobindgarh* was completed. A large bridge of four arches was built over a nallah crossing the road from *Dīnanagar* to the *Pindori* shrine; another large bridge was built near *Ikhlaspur*, on the *Shakargarh* and *Pathankot* road; and two bridges were constructed across the escape from the large "chamb" or marsh on the roads from *Gurdāspur* and *Dīnanagar* to *Naushahra*. Fifty-two minor bridges were constructed on various roads in the *Gurdāspur* District.

216. Materials were prepared for the bridge over the *Reya* nallah at the 40th mile of the *Amritsar* and *Siālkot* road, and the metalling of some sections of the road was in hand. The road from *Siālkot* to *Dera Nanak* was raised, levelled and bridged; a metalled gap and two bridges were constructed on the *Zaffarwāl* and *Pasrūr* road; and a new line of road, 12 miles long, was opened out between *Dhamtal* and *Nārowāl*. The main line of road through the *Siālkot* District to *Jummoo* was levelled with a view to metalling. Mile-posts were provided along the *Nārowāl* and *Lahore* road, and sign-posts at various crossings.

## COMMUNICATIONS.

## Lahore District.

217. In the *Lahore* District, a metalled road connecting the *Lahore* and *Ferozepore* road with the *Râewind* road was completed ; bridges were constructed on the *Ganda Singhwâla* and *Khudiân* road ; and other bridges on the road from *Sharakpur* to *Mângtânwâla* were in progress.

## Gujránwâla District.

218. A large wooden bridge over the *Dholan* stream, in the *Gujránwâla* District, was in progress ; also two bridges at *Beriwâla*, on the road from *Lahore* to *Kâdirabad*.

## Montgomery District.

219. An unmetalled road, 12 miles in length, was made between *Montgomery* and *Nirshah* ; a bridge was constructed partly from private contributions at *Nala Deg* ; and 13 other small bridges were provided on various roads in the *Montgomery* District.

## Jhang District.

220. In the *Jhang* District three masonry bridges were constructed over drainage canals crossing district roads.

## Mooltan District.

221. Two culverts were constructed over irrigation cuts on the road from *Mooltan* to *Shujabad*, and materials collected for others. On the road from *Mooltan* to *Bahâwalpur* three bridges were constructed, one of these being over the *Sikandrabad* Canal. Mile-stones and sign-posts on the road were also provided.

## Muzaffargarh District.

222. The metalling of the road from *Muzaffargarh* to *Khângarh* was continued, and eight bridges were constructed across canals and water-courses on other District roads.

## Bannu District.

223. The road from *Naurang* to *Lakki*, in the *Bannu* District, was raised for several miles to protect it from floods, and five bridges and culverts were constructed in various places.

## Gujrát District.

224. The submerged bridge over the *Budi nallah*, on the road from *Râmnagar* to *Pind Dâdan Khan*, in the *Gujrát* District, was completed. A small bridge was also constructed on the road from *Gujrát* to *Jalâlpur*.

## Shahpur.

225. In the *Shahpur* District the road between *Sodhi* and *Kohoki* was completed ; and a bridge constructed on the *Sodhi* and *Katwai* road.

## Hazâra.

226. A road was made in the *Hazâra* District connecting the *Manserah* road with the *Dhamtaur* road, and other connecting links with the Civil Station of *Abbottabad*. The construction of roads between *Pattan* and *Bâragali*, and *Salhad* to *Chamhad*, was also in progress.

## COMMUNICATIONS.

227. Several small unmetalled roads were constructed in the *Kohát* District. Kohát District.

228. A considerable expenditure was incurred in improving and bridging several of the *Pesháwar* District roads ; and a new road from *Abazai* to *Maruzai* was in progress. Pesháwar District.

## BRIDGES.

229. Materials were collected for the construction of a bridge across the *Buria Pul nallah*, on the *Delhi* and *Mathra* road. Delhi to Mathra.

230. The guiding and protective spurs on the *Márkanda* river, above the bridge near *Shahábad*, on the road from *Delhi* to *Umballa*, were strengthened, and a cut made to lead the stream. Delhi to Umballa.

231. The parapets and permanent roadway of the stone bridge over the *Mánjhi* stream at *Chaitru*, on the road between *Kángra* and *Dharmśála*, were nearly finished. The temporary wire bridge was removed and reconstructed over the *Khauli* stream near *Shahpur* in the *Kángra* District. Hoshiárpur to Dharmśála.

232. Over the *Pingu nallah*, on the *Dharmśála* and *Dera* road, below the *Gurkha* lines, a stone bridge was built.

233. The following bridges on the *Kángra Valley Road* were in progress or completed during the year :—Of the *Dehri* bridge, 214 feet span, at *Kotelah*, the left abutment, superstructure and entrance archway were finished. The water-proof covering of the wooden roadway was nearly completed. Kángra Valley Road.

234. The *Seon* bridge, five spans of 25 feet, was completed, but owing to heavy rains and considerable softening of the lower courses of the masonry, which were found to be of an inferior stone, a heavy settlement of the right pier occurred and rendered under-pinning necessary, which was successfully accomplished. Iron standards and railings for the roadway were made and carried to site.

235. A concrete bridge of 35 feet span semi-circular, over a nallah near the *Seon*, was constructed and opened for traffic.

236. The erection of a Warren-girder bridge of 85 feet span, at a height of about 80 feet, over the *Bánganga* or *Baner*, on the Cart Road below the Fort of *Kángra*, was in progress. The masonry abutments were raised to the bed plates, and the girders were placed in position and nearly completed. The girders were constructed in the *Roorkee Workshops*, and were tested with a distributed weight of nearly 77 tons, or 168 lbs. per square foot.

## COMMUNICATIONS.

## Kángra Valley Road.

237. A temporary wire-suspension bridge, of 160 feet span, was put up at a short distance to accommodate the cart traffic during the construction of the permanent bridge.

238. The *Triloknath* bridge, near *Kotelah*, was partly undermined during the monsoon by severe floods, and repairs to it were in progress.

239. The old timber structure across the *Buria* nallah, 27 feet span, was removed, and the abutments prepared for a masonry arch.

240. Protective concrete works also were carried out at both the *Khaul*i and *Darín* bridges, to prevent the scouring action of the floods upon the rock on which both bridges are built.

241. The additional arches and flooring of the *Nakir* bridge, five spans of 30 feet, on the road between *Ránital* and *Jáwálamukhi*, were completed to the extent sanctioned and provided for. A design has been furnished by the Executive Engineer of the Kángra Division to the Rájah of Mandi for a wire-rope suspension bridge, of 240 feet span, to be erected over the *Beas* at the City of *Mandi*.

## Kángra to Ladakh.

242. The erection of a wire-rope suspension bridge, 182 feet span, over the Chandra river at Koksar in *Láhu*l, was nearly completed, when a serious accident occurred as the work of the roadway was in progress: the main bars of the anchorage giving way, owing, as was found, to flaws in the iron. The re-construction of the bridge has been deferred. There is a wooden bridge (*sanga*) about three miles further up the river.

## Siálkot to Gurdáspur.

243. The progress of the bridge at *Gabri*, over the *Nománi nadi*, on the road from Siálkot to Gurdáspur, 3 spans of 30 feet each, was delayed both by the failure of the brick contractors and by difficulties in the work itself—the flooding of excavations from springs,—and other causes. One foundation well of the abutment on the right bank left the vertical and was fractured, necessitating removal of part of the masonry and the addition of an auxiliary well. At the close of the year the superstructure of the piers was half finished.

## Gurdáspur to Amritsar.

244. Work was continued on the bridge over the *Kiran nadi* on the road from *Dera Nanak* in the *Gurdáspur District*, to *Amrúsar*. This is a masonry bridge, of five spans of 30 feet, with the foundations of the abutments, piers, and wing-walls on masonry wells. The centrings were all put up, and the arches of the bridge were in progress.

## COMMUNICATIONS.

245. On the road between *Lahore* and *Pindi Bhatian*, water-wings were provided to three large timber-bridges, and to a number of the small masonry bridges, for the protection of the wing-walls. Lahore to Shahpur.

246. A bridge was constructed over the *Sikandrabad* Canal, in the *Mooltan* District, for the District Committee. Mooltan District.

247. Spurs were completed in the *Dina* nallah, on the Trunk Road between *Jhelum* and *Rawalpindi*, to guide the stream and to protect the bridge. Measures were also completed for the protection of the left abutment of the *Bakrāla* bridge. Jhelum to Rawalpindi.

248. The construction of a wooden bridge, of 40 feet span, over the *Salhad* nallah, on the road from *Abbottabad* to *Haripur*, was commenced, and nearly completed by the close of the year. Abbottabad to Haripur.

## BOAT-BRIDGES AND FERRIES.

249. The bridge of boats over the River Sutlej at *Phillour* was re-constructed for the passage of troops during the cold weather months. Owing to a deeper channel having been cut in the river, the length of the bridge was less than in the preceding year. Phillour.

250. The boat-bridge over the Sutlej at *Ferozepore* was opened in October with a single roadway. Considerable repairs were executed to the Government boats and the trussed beams of the bridge. Owing to changes in the current of the river the bridge was nearly half a mile in length, and a number of additional boats had to be hired. Ferozepore.

251. The stores of the boat-bridge over the River Ravi at *Shahdara* were completed up to the standard equipment, and the bridge was kept up and maintained in good order throughout the year. Shahdara, near Lahore.

252. Six new boats were constructed to take the place of hired ones for the bridge of boats over the River Indus at *Dera Ismail Khan*, and the other Government boats were painted and maintained in good order. This new bridge is reported to be of great service. Dera Ismail Khan.

253. New superstructure was in course of construction for the boat-bridge over the River Chenab at *Wazirabad*, and two light ferry boats were being built at the same place for the ferry. Wazirabad.

## COMMUNICATIONS.

- Jhelum.* 254. Some new superstructure was supplied to the boat-bridge over the *Jhelum* River at *Jhelum*.
- Pind Dādan Khan.* 255. For the bridge of boats over the *Jhelum* River at *Pind Dādan Khan*, nine new boats, with corresponding superstructure, were constructed.
- Attock.* 256. Two new boats were constructed for the boat-bridge over the River *Indus* at *Attock*, and the bridge maintained during the cold season.
- Kohāt District.* 257. Three new boats were purchased and an existing boat renewed for the ferries in the *Kohāt* District.
- Naushahra.* 258. The new bridge of boats over the *Kabul* River at *Naushahra* was completed and opened for traffic.
- Peshāwar District.* 259. The *Nahakki* bridge of boats in the *Peshāwar* District was maintained ; and four boats purchased for ferries in the District.

## ACCOMMODATION FOR TRAVELLERS.

- Gurgāon District.* 260. Several tanks and wells in the *Gurgāon* District for the use of travellers were improved ; and a shed for travellers was provided at the *Gurgāon* Railway Station.
- Karnāl District.* 261. Water-troughs were supplied to wells along the Grand Trunk Road in the *Karnāl* District.
- Hissār District.* 262. Additions were made to the staging bungalow at *Hissār*.
- Sirsa District.* 263. The staging bungalow at *Fázilka*, in the *Sirsa* District, was enlarged, and out-offices provided. The *Sohwāla* supply-house was added to ; and the District rest-houses taken over from the Customs Department were put into complete repair.
- Umballa District.* 264. A small sarai was erected near the Railway Station at *Barāra*, in the *Umballa* District. Another sarai at *Abdulapur*, near *Jagādhri*, was constructed by *Sirdār Jīwan Singh*. A supply-house was provided at the encamping ground at *Umballa*.
- Ludhiāna District.* 265. A well was supplied at the *Dakha* encamping ground in the *Ludhiāna* District.
- Jullundur District.* 266. A sarai was constructed at *Bohran*, half-way between *Phagwāra* and *Rāhon*, in the *Jullundur* District.



## COMMUNICATIONS.

267. The new staging bungalow at *Patháńkot*, the terminus for dák carriages on the journey to *Dalhousie* and *Dharmśála*, was completed, and the approaches to the building were undergoing improvement. Two wells for travellers were constructed at places where they had been much needed on the roads from *Mádhopur* to *Patháńkot*, and from *Kot Naina* to *Jasrota*, in the *Gurdáspur* District. Gurdáspur District.
268. Two additional sets of rooms were provided to the dák bungalow at *Lahore*. Tanks for watering cattle were constructed at the *Kasúr* and *Luliáni* encamping grounds in the District. Lahore District.
269. A new dák bungalow containing two sets of rooms, with the necessary out-offices, was constructed at *Shekhupura*, in the *Gujráńwála* District. A new dák bungalow was commenced near the Railway Station at *Wazirabad*, and the building was about half-completed by the end of the year. Gujráńwála District.
270. The new staging bungalow at *Chíchawatni*, in the *Montgomery* District, was completed. Seven wells for travellers were constructed, one at *Chíchawatni*, and the others along various District roads, half the cost of one of them being met by private contributions. Montgomery District.
271. The sarai at *Koh-i-Kurána*, in the *Jhang* District, on the road to *Shahpur*, was improved. Jhang District.
272. Two sarais were constructed near the tahsils of *Alipur* and *Sanáwán*, in the *Muzaffargarh* District. Muzaffargarh District.
273. Two rest-houses for travellers were erected at *Bhakkar* and *Mankera*, in the *Dera Ismail Khan* District, on the road between *Dera Ismail Khan* and *Jhang*. Two sarais also were constructed at *Band* and at *Chaudhódn*, on the *Dera Ismail Khan* border. Dera Ismail Khan District.
274. Along the new Postal line in this District, *Cis-Indus*, three wells were constructed, and old and deserted wells of Sikh construction along the line renewed. A masonry tank was provided at *Patah*, on the road between *Dera Ismail Khan* and *Táńk*; and another constructed on the *Peyzu* slope of the *Shekh Budín* hill.
275. Work was continued on the well sunk through difficult soil at *Sakhi Sarwar*, a place of pilgrimage in the *Dera Gházi Khan* District, and water to a depth of 7 feet had been obtained, and the well was being further excavated. Dera Gházi Khan District.

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COMMUNICATIONS.

## Bannu District.

276. In the *Bannu* District a commodious sarai was constructed at *Wanbhachrán*, *Miánwáli*, on the road from the frontier *viâ* *Shahpur* to *Lahore*. A sarai was also built at *Kamarmasháni*, *Isa Khel*, on the line of road between *Isa Khel* and *Kálabágh*, where for a distance of 24 miles there was formerly no shelter for travellers.

## Gujrát District.

277. Wells for travellers were in progress at two places along roads in the *Gujrát* District.

## Jhelum District.

278. The supply-house at *Soháwa*, in the *Jhelum* District, was re-roofed.

## Ráwalpindi District.

279. A new sarai was built at *Dewal*, on the road to *Kashmir*, in the *Ráwalpindi* District.

## Hazára District.

280. The new staging bungalow at *Chánglagali*, on the *Murree* and *Abbottabad* road, was completed with the necessary out-offices, the former building having been made over to the Military Authorities. The new sarai at *Dungagali*, also on the above road, was finished. Progress was made with the construction of a sarai at *Hattar*, in the *Hazára* District, in which accommodation for European travellers also has been provided. Out-offices and godowns were provided to the rest and circuit-houses at *Kálapáni*, *Bagnetar*, and *Natiagali*, in this District, on the road between *Murree* and *Abbottabad*.

## Kohát District.

281. A new staging bungalow was erected at *Kohát*; and two masonry tanks for travellers were built in the district.

## Pesháwar District.

282. The new sarai at *Mardán*, in the *Pesháwar* District, was nearly completed; and progress was made with the construction of a staging bungalow at *Naushahra*. Seventeen wells and three tanks for travellers were constructed in the *Pesháwar* District, and two of the existing tanks were improved.

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## Miscellaneous Public Improvements.

Mis. Pub. Imprs.

283. Several buildings of architectural or historical interest in the *Delhi* District were repaired. In the city of *Delhi*, the ground round the infectious diseases hospital was levelled and cleared ; and considerable additions to the dispensary, aided by private donations, were in progress. Several of the more important roads in and about the city were improved and put into proper order ; part of the city ditch was excavated so as to carry off refuse water ; and the maintenance of plantations and other improvements were attended to. A tank was improved at *Faridábád*, and the roads in that town, and at *Sonepat*, were improved.

Delhi District.

284. A considerable expenditure was incurred in the improvement of tanks at various localities in the *Karnál* District.

Karnál District.

285. Two wells for the use of villagers were constructed in the *Rohtak* District. Grants-in-aid were given for the construction of two others ; and seventeen tanks and wells at various places were deepened and improved.

Rohtak District.

286. At the town of *Hissár*, two "gháts" for watering cattle were constructed ; new saucer-drains were made to improve the drainage ; five streets were paved with brick on edge ; and a new latrine was built. Excavations in the town and suburb were filled up, and sign-boards put up in several parts of the town and station. At the town of *Hánsi*, two new slaughter-houses were built, and a large sewage drain constructed. The drainage and paving of *Bhiwáni* were improved and extended, and several excavations in and about the town filled up. Improvements were also effected in the towns of *Fatahabad* and *Battia*.

Hissár District.

287. Bunds, or dams, were constructed in the *Sutlej* river, *Sirsa* District, to restore an old nallah called *Padi*, in which water has not flowed for eight years, and which will now benefit about 40 villages and the town of *Fázilka*. The enlargement of the *Sikandarpur* nallah, which will benefit about 12 villages and the town of *Sirsa* itself, was also in progress. In the town of *Sirsa*, reservoirs with masonry drains were constructed for watering the principal streets ; and the enclosures of the Municipal Hall and Government School were improved.

Sirsa District.

288. A bridge was built in the city of *Umballa*, and a bathing place for women at *Naurang Rái's* tank ; two streets in the city were paved. Municipal Committees' offices were constructed in the towns of *Shahabad* and *Sádhaúra*, *Umballa* District. Certain roads and approaches in the town of *Jagádhrí* were metalled.

Umballa District.

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MIS. PUB. IMPRS.

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Simla District.

289. The large drinking tank at *Simla*, near the Combermere bridge, was plastered with Portland cement, and made water-tight. The lower bazár road above the Assembly Rooms was re-built, and a good deal of improvement in the way of protective walling along roads and improved drainage was effected.

Ludhiána District.

290. Improvements of various kinds were made in the towns of Khanna, Máchiwára and Belálpur, *Ludhiána* District. The main city sewer at *Ludhiána* was extended in part of a scheme approved by the local Railway Engineer.

Ferozepore District.

291. Several small canals were opened out from the River Sutlej in the *Ferozepore* District, and others projected. Work was continued on the tank at Moga, *Ferozepore* District.

Jullundur District.

292. A town-hall, to be used for meetings of the Municipal and District Committees at *Jullundur*, was in progress on a site taken from the public garden near the city. New pavements were laid down in the city, and new latrines constructed in the suburbs.

Hoshiárpur District.

293. In the hilly tracts of the *Hoshiárpur* District, 20 new wells were constructed, and others were in progress, and 82 wells and tanks were restored and improved, towards the cost of which the village-people contributed. A sarai in the town of Khánpur, *Hoshiárpur* District, was constructed for the convenience of traders and others. Alterations and improvements in the arrangements for a slaughter-house in the town were also effected. Some streets in the town were paved with metal; and a well provided near the dispensary. A handsome dispensary was built in the immediate neighbourhood of the town of Una, *Hoshiárpur* District; and in the town of *Urmar* streets were paved and drains provided.

Kángra District.

294. The *Kángra* bazár road was metalled, and the bazárs at *Núrpur* and *Sultánpur* were paved.

Amritsar District.

295. The filling in of the "dhábs" or hollows in the city of *Amritsar* was completed, and two new gateways were built in place of those demolished some years ago. Enclosures were constructed for the conservancy cattle, and a Municipal godown and workshop were built.

Gurdáspur District.

296. The encroachments of the River Ravi having threatened seriously the town and shrine of Dera Baba Nanak in the *Gurdáspur* District, measures were continued for their protection by spurs thrown out from the bank, and by a

## MIS. PUB. IMPTS.

## Gurdáspur District.

diversion of the river. Groins were constructed across the low water channels about two miles above the town, and in line with them cuts were made conducting the water towards a channel which had opened the previous season. The floating spurs have been very effective in promoting the deposit of silt. The arrangements altogether have been attended with much success.

297. A Municipal hall was completed in the town of *Pathámkot*; and another erected at *Dera Nanak*. The circular road at *Batála* was raised and metalled. The streets of several towns in the *Gurdáspur* District were paved and improved.

## Siálkot District.

298. Two wells were constructed at places where they were much needed in the *Siálkot* District. A meeting house for the Municipal Committee was erected in the town of *Jámki*, and a small house for the accommodation of traders and travellers in the corn-market at *Siálkot*. Streets were paved and others metalled in several towns in the *Siálkot* District, and a bathing place for women was constructed near the tank at *Kila Sobha Singh*. The drainage of the town of *Siálkot* was improved.

## Lahore District.

299. The terrace wall between the Imperial Mosque and *Hazúri Bágh* in the city of *Lahore* was re-constructed. A fresh survey was made of the *Lahore* city in view to the project for improved drainage and water-supply. A bathing ghát for women was built at the "Mochi" gate of the city; two new latrines in the city were provided; and the *Hazúri Bágh* gateway of the city was renewed. Part of the main road between *Anárkali* and *Meean Meer* was fenced, and garden plots planted along it. Municipal halls were in progress at the towns of *Kasúr* and *Patti*, and one was erected at *Khem Karn*. Streets were paved and drained, and wells provided, in several towns in the *Lahore* District. The cattle-approaches to tank at *Bháí Balol* were improved; three new wells were built at various localities; and a bund made across a tank at *Mángah* to protect the village in time of floods.

## Gujránwála District.

300. Two principal streets were metalled in the town of *Gujránwála*, and a masonry drain was constructed from the town through the garden into a neighbouring tank. At *Wazirabad*, the drain from the town into the *Palku nallah* was carried on; and some of the streets of the town were paved with brick. Streets were metalled in some of the minor towns in the *Gujránwála* District; bridges built at two of them; and a bathing ghát for women at one place. A large *pacca* tank was in progress at *Háfizabad*.

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## Montgomery District.

301. A "char," or water-course, near Kamália, in the *Montgomery* District, was completed. A pacca tank in the town of *Montgomery* was nearly half-finished. Committee-houses were constructed at *Pákpattan* and *Dipálpur*, and that at *Kamália* was added to and improved. In *Saidwala* a tank was commenced and nearly finished ; six latrines were constructed and some streets paved in the town of *Kamália*, and the main street of the town of *Hujra* was paved and put in order.

## Jhang District.

302. A new metalled road was made at *Jhang-Maghiána*, and the principal streets were paved. A tank in the town was improved, and a large hollow filled near the *Maghiána* bazár.

## Mooltan District.

303. Two masonry wells were in progress in the *Mooltan* District.

## Muzaffargarh District.

304. Municipal offices were erected at Sitpur and Shahr Sultán, in the *Muzaffargarh* District. A large well was constructed at *Alipur*, and progress made with the paving of the bazár at *Khairpur*. Latrines for women were constructed at *Muzaffargarh*, and at four other towns in the District.

## Dera Ismail Khan District.

305. The brick pavements in the town of *Dera Ismail Khan* were extended, and the main thoroughfares are now substantially paved throughout. The Povindah sarai was supplied with a new gateway, and a new road made in the town of *Kuláchi*. A well was sunk at Teri, in the *Dera Ismail Khan* District, and a tank was dug at *Haidarabad*. Advantage was taken of heavy rain-fall in the Waziri hills to conduct water by newly improved channels to villages in the dry plain below, inducing villagers to return to their deserted homesteads.

## Dera Gházi Khan District.

306. A bund was constructed round the town of Hájipur, in the *Dera Gházi Khan* District, to preserve it from inundation. Progress was continued with the masonry drains in the town of *Dera Gházi Khan*, and a large hollow behind the sarai at *Dera Gházi Khan* was filled in. The drainage of the town of *Rájanpur* was improved. Two wells were constructed for the benefit of sub-montane villages at Chaidji and Mamdání, in the *Dera Gházi Khan* District, a part of the cost being defrayed by the people. An exploration of the coal resources of the Sulemán Range, in the *Dera Gházi Khan* District, was made, and coal of good quality found, but in too small quantity, and too disadvantageously situated, to encourage the working of it.

## MIS. PUB. IMPTS.

306. A masonry tank, with roof, was built near the Lakki gate of the town of *Bannu*. The public garden at *Edwardes-abad* was much improved with the aid of private subscriptions. Four wells were constructed at places in the *Bannu* District, where there was formerly no water. A well also was completed in the *Cis-Indus thal*; and a masonry tank built at *Isa Khel* near the sarai.

*Bannu District.*

307. Some roads in the station of *Gujrāt* were metalled, and new pavements were laid down in several streets in the town, where metalling with broken brick has been found not to answer. The streets of several other towns in the *Gujrāt* District were also paved and drained. Several new wells were sunk for the benefit of villages in dry tracts of the District.

*Gujrāt District.*

308. Two kacha tanks in the *Jhelum* District were lined with masonry; the bund at *Talagang* was completed; and a new bund to form a tank made at *Chakowāl*, for which large private contributions were received. A Municipal Committee-house was built at *Chakowāl*. Further progress was made with the masonry embankment along the river at *Jhelum* to protect the town. Latrines were provided for females in the town of *Jhelum*; ditches were filled up in the town of *Pind Dādan Khan*; and the streets of several towns in the District were paved.

*Jhelum District.*

309. Much useful work was done and improvements made to the drainage, streets and wells of town in the *Shahpur* District.

*Shahpur District.*

310. Fifty-three tanks for the benefit of villagers, &c., were constructed or improved in the *Rāwalpindi* District. The new bridge over the *Leh* stream near *Hukma Singh's* sarai, on the direct road from the city of *Rāwalpindi* to the Lahore and Peshāwar Road, was nearly completed, and has since been opened for traffic. Roads in, and approaches to, the city were metalled, and some streets were paved. The experimental well, sunk in connection with the *Rāwalpindi* water-supply project, was not successful. At Hazro, in this District, a large masonry tank was under construction; and the streets of other towns were paved and drained. New masonry drains, revetment walls for roads, boundary pillars, and a Municipal police-house, were constructed at *Murree*.

*Rāwalpindi District.*

311. In the town and suburbs of Haripur, in the *Hazāra* District, masonry channels are being supplied to the numerous water-courses for the supply of good water to the

*Hazāra District.*

## MIS. PUB. IMPTS.

## Haráza District.

people. A filter-tank also was constructed, and proved a success, and the Hindús desire another made for their use. A public latrine was built outside the town. A masonry bathing tank was constructed at *Nawashahr*.

## Pesháwar District.

312. The explorations carried on annually by parties of Sappers were last year made in the mound or collection of mounds known as *Sháhji-ki-Deri*, near the city of *Pesháwar*, believed by General Cunningham to be the great Stupa of Kanishka. The results at this place were not of much value. The Company of Sappers then proceeded to take up work at *Takkál* to the west of the *Pesháwar* Cantonment, where some good sculptures had formerly been obtained. The explorations at this place promise to be of much interest. It is intended to resume the work next cold weather. The foundations of a large quadrangular enclosure, with adjoining courts and cells, have been exposed, and detached portions of other buildings, the full plan of which will, it is hoped, be determined by further excavation and clearance. Some coins were found and were sent to the Director General of the Archæological Survey, and some fragments of sculptures were sent to the Lahore Central Museum.

313. The *Pesháwar* city drainage works made further progress, and so far as completed continued to be favorably reported on. Hollows were filled at several towns and villages in the *Pesháwar* District; advances were made for the construction of bunds at certain villages; masonry steps were constructed at the *Shaikh-ka-Katta*; and an aqueduct over *Sháhi Máhal*.

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### PART III.—(IMPERIAL) IRRIGATION.

314. Owing to the small rain-fall during the cold weather, and the great demand for water in consequence, this canal was not, as usual, closed for repairs.

BARI DOAB CANAL.  
Canal not closed for repairs.

315. The substitution of permanent water-course heads, for the temporary wooden ones formerly in use, has been lately sanctioned; the necessary pipes required have been obtained from the 2nd Division Bári Doáb Canal, and collected at the most convenient places for distribution to the several rájbahás. A few heads have already been fixed on the *Salámpur Rájbaha*.

1st Division.  
Permanent water-course heads.

316. The repairs that could be executed to the masonry works generally were very trifling, on account of the canal not being closed. Only distributaries were therefore cleared of silt, but of these 122 miles were cleared.

Repairs.

317. The whole of the buildings were maintained and repairs executed where necessary.

Buildings.

318. The alterations in slope and width to the *Sujánpur* catch-water drain, rendered advisable by the breach in July 1873, acted very beneficially in carrying off the drainage of the country during the rains. The bunds and defence works on the nallah stood well.

*Sujánpur* defence works.

319. Two boulder bunds were completed below *Bheri* for the protection of the *Salámpur Rájbaha*.

Protective works,  
*Salámpur Rájbaha*.

320. Although there were no heavy floods in the Ravi during the rains of 1874-75, yet the river continued high; but, owing to the previous silt-clearances above and below the outlet, there was a marked improvement in the bed of the river, the old deep channel on the right bank having silted up for a considerable distance above the weir, and the main channel in front of the inlet assumed a broad shallow bed. Below the outlet the river cut a straight course for itself instead of the former tortuous one.

State of Ravi above weir.

Owing to the scour along the foot of the bund for diverting the main stream to the outlet, a large portion of the bund was carried away, and the greater volume of water passed down the old deep channel: on the river subsiding, bunds were thrown across this channel (by the Special Works Division) to divert the whole available supply of the river into the canal.

321. The permanent weir was uninjured by any of the freshets during the year, beyond the displacing of a few stones. The crest of the weir on the right flank has been raised during the past cold season (by the Special Works Division). The cut-waters of the inlet were somewhat damaged, and two,

Ravi weir.

## IRRIGATION.

**BARI DOAB CANAL.** which have been removed as an experiment, tend to show that cut-waters were not required ; the masonry of the inlet is otherwise in good order. The outlet had eight gates carried away, of which all but one were recovered. The gates have been repaired and re-fixed in a different manner. The raft channel flooring was repaired where injured. The regulator and dam are in good order.

**Rapids.**

322. Four rapids were arched over with light concrete arches in place of the wooden platforms previously in use, and hand railings have been fixed on all the rapids over which these arches have been built.

**Chakki torrent and Dhangu cut.**

323. There were several high floods in the *Chakki* during the year. The bund above the *Dhangu* cut was uninjured, but the greater portion of the repairs executed in the cut itself were carried away, only two fragments of the old revetment wall being now left standing. This cut was widened by the removal (by blasting) of the conglomerate reefs on the left bank. The bund on the right bank below the cut was slightly damaged, and the bund across the old excavated channel carried away.

**Pakhowál defence bund.**

324. The raising of the *Pakhowal* defence bund has prevented the flooding of the lands behind the bund.

**Kánowán Chamb drainage works.**

325. During the past cold season the tail end of the *Kánowán* drain was excavated to its full depth, and this has already considerably lowered the surface of the water in the drain itself ; further operations are still in progress to deepen the drain into the *chamb*, which it is expected will drain all but the lowest-lying places.

**Plantations.**

326. Little more than maintenance of existing plantations and nurseries has been effected during the year.

**Discharges of Rivers Ravi and Beas.**

327. The following are the results of those taken during the year :—

**RIVER RAVI.**

<i>Date.</i>	<i>Place.</i>	<i>Discharge.</i>
18th April 1874 ...	At Sidhouri ...	12,482 c. ft. per sec.
19th September „ ...	Above weir ...	10,339 „
„ December „ ...	Head channel ...	2,007 „
„ January 1875 ...	Ditto ...	1,767 „
„ March „ ...	Below outlet ...	5,274 „

**RIVER BEAS.**

18th April 1874 ...	At Naushahra ...	13,701 „
19th September „ ...	Ditto ...	22,341 „
„ December „ ...	Ditto ...	4,522 „
„ January 1875 ...	Ditto ...	3,221 „
„ March „ ...	Ditto ...	5,087 „

328. The substitution of permanent irrigation outlets for the former temporary ones was continued throughout the year. The number fixed was 1077, making a total to date of 5331 completed, and leaving 2184 of the number estimated for still to be finished.
329. Permanent parapets in lieu of the previously constructed temporary ones were substituted on one bridge.
330. The addition of out-houses to some of the rájbaha chaukís was sanctioned and commenced during the year.
331. As the canal was not closed for repairs, the main channel was not cleared from silt, but the usual clearance of jungle was effected from both banks of the canal.
332. The distributaries throughout the Division were cleared from silt.
333. The maintenance of existing plantations and nurseries was carried out as usual. The line trees along the canal banks have been made good where necessary, and a few gaps only remain. The sowing for fuel plantations was not very successful, owing to the drought and subsequent severe frosts which killed many of the young trees. Out of 30 acres sown, only 15 acres have yielded fair results.
334. Kasúr and Sobráon Branches now in course of construction. The works on this Division are chargeable to the extraordinary grant.
335. The buildings on this Division are completed with the exception of some small items, such as white-washing and fittings. Six first class inspection bungalows were completed, and one more nearly finished. Seven second class were also completed during the year. The buildings already completed were maintained in good repair.
336. The regulating head at the bifurcation of the Kasúr and Sobráon Branches at *Sathiáli* was completed, with the exception of its parapets.
337. Six falls with bridges have been completed, and fourteen more are in progress; five of these are having the parapets built, and the other nine are well forward. Five ordinary road bridges are completed, besides seventeen in various stages of progress, six of which are having the parapets constructed. Many of these works, being principally built of concrete rammed *in situ*, could not be pushed on rapidly, as they require more care and attentive supervision than ordinary masonry.

## IRRIGATION.

## BARI DOAB CANAL.

## 2nd Division.

Permanent outlets.

Parapets of bridges.

Chaukís.

Clearance of banks.

Silt clearance of distributaries.

Plantations.

## 3rd Division.

Kasúr and Sobráon Branches.

Masonry works.—  
Buildings.Regulating head at  
*Sathiáli*.

Bridges and falls.

## IRRIGATION.

**BÁRI DOAB CANAL.**  
*3rd Division.*  
 Collection of materials.

338. The collection of materials for the masonry works has been pushed on during the year, and a large quantity of bricks have been manufactured.

Excavation of channel.

339. Nearly all the earth-work executed during the year has consisted in clearing out the old channel of 1855-56, dressing of slopes, and repairing work done in previous years. The banks were found to have lost nearly one foot in height, partly owing to settlement, and partly from the effects of the weather, a great quantity of earth having been washed into the canal channel. The channel has been cleared out to its proper level, the banks and slopes having been made up again and dressed. The progress on work of this character was naturally slow ; but 28,382,421 cubic feet were executed on the Kasúr, and 12,519,102 cubic feet on the Sobráon Branch.

Admission of water.

340. A small stream of water was let into the channel at the regulator at *Tibri* on 30th November 1874, but, owing to the demand for water elsewhere, was shut off again on the 24th December 1874. The water was again let in on the 11th March 1875, and reached the *Sathiali* regulator on the 23rd of same month. It has since been admitted to the branches, and has reached the 20th mile on the Sobráon and the 10th mile on the Kasúr Branch.

Surveys of drainage lines.

341. The surveys for the examination of the secondary drainage lines were carried on during the year.

*Special Works Division.*

342. This Division comprises the re-modelling of the main line and the completion of distributaries of the Bári Doáb Canal.

Ravi weir and heads works.

343. The spur above the weir for diverting the river to the left bank, which was considerably damaged by scour, was thoroughly repaired, and protected by large crates filled with boulders and by trees anchored up-stream.

Re-modelling Main channel.

344. The estimate for this work was sanctioned during the year ; but, owing to the canal not having been closed for repairs in the cold season, no works could be executed in the main channel. The completion of distributaries was commenced. On the *Thammam rájbaha* earth-work is in progress throughout its length, and on the *Turkwind* a fair start has been made. The detailed estimates are not yet completed for these works for want of certain information as to the compensation of land, which is awaited from the Civil Officers of the District.

Thammam and Turkwind Rájbahás.

## IRRIGATION.

345. The new buildings connected with the alteration of the saw-mills into workshops were completed in December 1874, and have stood well.

BARI DOAB CANAL.  
Workshops Division.

346. The stores have nearly all been removed from the shops on the east bank of canal to the new buildings. The remainder will be moved over as required, with the exception of some iron which is for sale.

Occupation of new buildings.

347. The whole of the machinery has been fitted up, and works satisfactorily.

State of machinery.

348. The quantities of iron-work executed in the workshops during the year were—

Work executed.

						Maunds.
Castings	...	...	...	...	...	871
Wrought-iron	...	...	...	...	...	596

showing a decrease on the former, but an increase on the latter class of work as compared with the preceding year.

WESTERN JAMNA  
CANAL.

349. The usual closure of this canal for repairs was not effected on account of the great demand for water in consequence of the small rain-fall. It was, however, closed from 9th to 20th February 1875 on account of heavy rain.

Canal not closed for repairs.

350. The new inspection bungalow at *Jagádhrí* was completed during the year.

Karnál Division.  
Jagádhrí Inspection bungalow.

351. The cut for the diversion of a portion of the drainage of the *Pandhoi* nallah into the *Sombe* river was completed, but the compensation for land has not yet been fully paid, owing to the difficulty experienced in coming to a settlement as to its value, as it belongs to a Native State : 1,459,241 cubic feet of earth-work were excavated.

Pandhoi nallah drainage.

352. The construction of an earthen bank and bund on left bank from *Taprána* to *Singhoa* was carried out, 380,000 cubic feet of earth-work being executed. The channel at *Táyáwála* was excavated, and a spur constructed. The Jumna and second head bund were repaired, and the road from *Dádúpur* to *Kháwan* raised. From the *Budha Khera Escape* 2,058,000 cubic feet of silt was cleared, and 258,000 cubic feet from distributaries.

Repairs and silt-clearances.

353. About six acres of young trees were planted out, besides the ordinary maintenance of existing plantations and nurseries.

Plantations.

## IRRIGATION.

WESTERN JAMNA  
CANAL.

## Discharge of Jumna.

354. The following are the results of those taken during the year of the River Jumna :—

<i>Date.</i>	<i>Place.</i>	<i>Discharge.</i>
23rd August 1874	... Nagla ..	39,677 c. ft. per sec.
7th July "	... Railway bridge	31,865 "
22nd August "	... "	44,278 "
19th December "	... "	735.68 "
20th January 1875	... "	675.87 "
28th December 1874	... Hathni Kund	2,967 "

*Delhi Division.*

## Closure of canal.

355. The closure of canal in February 1875 was barely preceptible at *Delhi* on account of heavy local rain.

## Permanent outlets.

356. The manufacture of earthen-ware pipes for permanent water-course heads was continued during the greater part of the year. The works were obliged to be stopped during the month of March 1875, owing to the demand for money for Bengal. Out-turn to date, 73,900 tiles and 35,400 collars.

Repairs and Silt-  
clearance.

357. The total length of distributaries and water-courses cleared from silt during the year was 100 miles.

Plantations: damage to  
trees by monkeys.

358. The usual maintenance was carried out, and young trees planted out on the canal banks where required. The monkeys, which have increased to a great extent, still continue to do much damage to the young trees, and also to the crops adjacent to the canal. The young trees planted out in 1874 have mostly proved failures on this account, although protected by a low mud wall and with hurdles.

## Discharge of Jumna.

359. The discharge of the River Jumna, taken at *Wazirabad Ghat* on the 24th December 1874, was 1410 cubic feet per second.

*Hansi Division.*Repairs and Silt-  
clearances.

360. Silt-clearances were effected during the year on the *Rohtak* Canal and from the head to the *Bamsirra* regulator on the *Darbah* Canal. The rest of the canals were maintained as far as possible ; but, owing to the canal not being closed for repairs as usual during the cold weather, little could be done. Fourteen of the distributaries were cleared of silt.

## Buildings.

361. Two of the inspection bungalows were re-roofed, and the necessary repairs executed to other buildings.

362. Besides the usual maintenance of existing plantations and nurseries, several young trees have been planted out, and surrounded by a fence made of bamboos and cotton stalks to preserve them from the monkeys, which still continue to do much damage to the young trees, both when planted out and also in the nurseries.

IRRIGATION.  
WESTERN JUMNA  
CANAL.  
Plantations.  
Destruction of trees  
by monkeys.

363. This Division comprises the new head works on the River Jumna for the Western and Eastern Jumna Canals. Expenditure is chargeable to the Extraordinary Grant.

Head Works  
Division.

364. These have progressed rapidly during the year, and the following statement shows the main heads on which work has been commenced, and the quantities executed to end of year 1874-75 :—

Masonry works.

				Cubic feet.
Weir and sluices	...	...	...	650,613
Western Jumna Canal regulator			...	142,925
Eastern Jumna Canal	do	...	...	31,223

Total ... 824,761 up to date.

The total amount of masonry work executed during the year under review was 666,444 cubic feet.

365. The progress under this head has not been so good as was anticipated; the possession of the land required for the Eastern Jumna Canal supply-channel and for the left protective embankment not having been obtained. The progress on the Western Jumna Canal supply-channel was also interrupted during the month of March 1875, as the whole of the labor available was engaged in making good the damage done to the works by a flood which occurred on the 16th February 1875. The actual amount of excavation to date is 9,735,817 cubic feet, of which 4,929,677 cubic feet were excavated during the year. The right protective embankment has been completed; the total quantity executed, 913,728 cubic feet, is in excess of the estimated quantity by 154,292 cubic feet, but this excess was caused by damage from floods. The left protective embankment could not be commenced, as the land was not made over.

Earth-work.

366. *Buildings.*—The temporary shelter required for the accommodation of the Engineering Staff and Office Establishment, &c. has been completed.

Shelter for Staff.

367. The tramway laid down for the carriage of materials has been most successful; the results obtained show a very large saving as compared with carriage by country carts, of which only a small number are available, and the number

Success of tramway.

## IRRIGATION.

WESTERN JAMNA  
CANAL.

## Materials collected.

of carts could not have been obtained in the District to supply the materials which have been carried by the tramway to the works during the year. The quantities of materials collected during the year were as below :—

Lime stone collected	...	...	...	137,327	Cubic feet.
Bricks burnt	...	...	...	1,742,000	Number.
Soorkhee made and used	...	...	...	176,553	Cubic feet.
Lime, burnt	...	...	...	95,459	"
Fuel of different kinds collected and used	...	...	...	566,031	"

Flood in Jumna in  
February 1875.

368. There was no great rise in the Jumna during the rainy season, though it remained high throughout ; the river was highest on the 5th July 1874. On the 14th, 15th and 16th February 1875 there was a fall of 3·40 inches of rain, and the river in consequence rose 4·70 feet, doing some damage to the works. The velocities were taken several times during the season ; but, as they were not considered reliable, the discharges were not calculated.

New Main Line  
Division.  
Progress made.

369. This Division having only been commenced late in the year under review there is little progress to report. The line has been marked out for 43 miles, and the greater portion of the land required purchased. Bench-marks have been built on the entire length. The collection of materials has been commenced, and the work may be expected to proceed rapidly so soon as the detailed estimate has been sanctioned. This estimate has been submitted since the close of the official year.

New Delhi Branch  
Division.  
Progress made.

370. This is also a new Division, and was only commenced in January 1875. The progress consists in the permanent alignment and the surveys required for the land plans of the line, all of which have made good progress.

Special Survey  
Division.

371. This Division comprised (before the separation of the last two named Divisions) the completion of the designs and estimates for the re-modelling of the main lines of the Western Jumna Canal, and for the new distributaries, as well as the work actually in progress on those rájbahás estimates for which had been already sanctioned.

## Rájbahás 4 and 9.

372. The works on the new rájbahás Nos. 4 and 9 were in progress throughout the year.

## Materials collected.

373. The collection of materials for the new distributaries, and also for the re-modelling, was proceeded with.

Delhi and Gurgaon  
Works.

374. A good many unusual works had to be executed during the year to maintain the bunds and increase the storage in the reservoirs. Boundary pillars were erected where required on all bunds, and along the whole length of the Najafgarh jhíl drainage cut.



## IRRIGATION.

WESTERN JUMNA  
CANAL.

## Plantations.

375. Four hundred young *jáman* trees were planted out on the slope of *Jharsa* bund near Gurgáon, but many were washed away by the rains, and others eaten by white ants, all of which have had to be renewed.

## INUNDATION CANALS.

## Upper Sutlej Division.

376. The canals from the right bank of the Sutlej in the *Lahore* and *Montgomery* Districts form this Division.

## Extent of work done.

377. The usual maintenance of works and buildings was effected during the year. A breach in the *Khánwah* Canal was made good. The *Khánwah* Canal was cleared of jungle from *Hujra* to *Dipálpur*. The total amount of silt-clearance carried out was 20,994,186 cubic feet, and this was executed at a rate lower than that of the two previous years.

Rájbahás from  
Katora Canal.

378. The new rájbahás from the *Katora* Canal were in progress, and the regulator in canal with the rájbaha heads were about half completed at the close of the year. The masonry was a good deal delayed by the failure in supply of bricks.

## Earth-work.

379. The quantity of excavation done during the year on these rájbahás was 17,336,000 cubic feet. The Executive Engineer expected to have the works sufficiently forward to supply water from these distributaries for the next crop.

## Plantations.

380. Only maintenance of existing nurseries, &c. carried on during year.

## Discharge of Sutlej.

381. The minimum discharge of the River Sutlej was observed at *Kasoki* with results as follows :—

				Cubic feet per second.
19th December 1874	...	...	...	7,248
19th January 1875	...	...	...	6,286

Lower Sutlej and  
Chenab Division.

382. The canals in the *Mooltan* District form this Division.

## Buildings.

383. The inspection bungalow at *Mamdah* was completed during the year, and the existing buildings repaired where necessary.

## Silt-clearances.

384. The greater part of the silt-clearance and repairs to channels were, as in previous years, carried out by unpaid statute labor, or by free labor paid from the Fine Fund. The mileage of canals kept in repair during the year was 690 miles, of which about 639 miles were cleared of silt.

River Protective  
Works at Mooltan.

385. The embankment along the bank of the *Chenab* to protect the station and city of *Mooltan* was reached by the floods of 5th July 1874, but they did no further damage than causing it to settle in a few places. These places were repaired, and the rest of the embankment maintained in good order.

## IRRIGATION.

INUNDATION CANALS.  
Plantations.

386. Some seeds were sown along the Chenab embankment, but the young plants were considerably injured by the floods. The existing plantations were maintained.

## Discharge of Ravi.

387. The discharge of the River Ravi, taken on 19th December 1874, was 112·2 cubic feet per second. On the 19th January 1875 no discharge could be taken, as the bed of the river was almost dry.

*Dera Ghazi Khan*  
Division.

388. This Division comprises the Inundation Canals, supplied by the Indus, in the *Dera Ghazi Khan* District.

Kála and Bahár Shah  
Bunds.

389. The floods of July and August 1874 were most unusually severe, and that of the 10th August was higher than any known flood since 1856, in which year part of the town and cantonments of *Dera Ghazi Khan* were carried away. The river having continued to set over to the western bank, the erosion threatened to carry away the southern portion of the great *Kala* embankment; a new line further back was therefore estimated for and sanctioned. On the *Bahár Shah Bund* the works were continued, and nearly completed.

## Shah Jamál Bund.

390. At *Shah Jamál* the floods threatened to carry away the southern end of the embankment, and, in order to prevent the loss which would have been thus occasioned, a loop line was constructed in June. A short embankment was thrown up at *Buliwála* between the Dhundi and Kutab Canals, which has stood well, and done good service.

Shoria and Chibbri  
Canals.

391. The widening of the Shoria and Chibbri Canals, in progress last year, was completed in April 1874.

## Silt-clearances.

392. The annual silt-clearances were carried out over a length of 478 miles of canals, the excavation being 43,175,000 cubic feet. The large excess in quantity excavated during the year, as compared with previous years, is due to the much larger deposit of silt and the unusually severe damage done by the hill torrents.

## Boundary roads.

393. The improvements to the boundary roads, alluded to in last year's report, have proved most successful, though much yet remains to be done to render all the canals easily accessible. The mileage of these boundary roads completed is nearly 151 miles.

Masonry Works and  
Buildings.

394. The new inspection bungalow at *Paiga* was completed in November 1874. The estimates for two regulators, one on the *Kastúri* and the other on the Shoria Canal, were sanctioned, and the works commenced. The necessary repairs to the other masonry works and buildings in the Division were executed.

## IRRIGATION.

## INUNDATION CANALS.

## Plantations.

395. About 5300 young trees, chiefly *kikar* and *shisham*, were planted out, but about 3400 were killed by the severe cold of the season. Two new nurseries were established, and the existing plantations maintained.

## Discharge of Indus.

396. Observations were taken on the 19th December 1874 and 19th January 1875 to ascertain the minimum discharge of the River Indus.

## Area irrigated.

397. The area irrigated was measured in accordance with the new rules, but the work progressed slowly, and the result shows that a permanent, instead of a temporary maintenance establishment, should be employed, as, owing to the men engaged during the irrigating season being discharged on the closure of the canals, there is no one to point out the areas irrigated to the measuring parties; nor, in cases of dispute, is there any one to give evidence.

## STRETCH CANAL.

## 1st Division.

398. This Division includes the first eleven miles of the main line, the head works and collateral works.

## Masonry works at head.

399. The masonry of the dam at *Rupar* was commenced towards the close of the year. The excavation for the foundations of part of the revetment wall above the regulator was commenced, and the masonry has proceeded with unexpected ease, the foundations having been kept dry by a 10-inch centrifugal pump. This result is most satisfactory, as it gives good reason to expect that the whole of the head works may be thus executed without having recourse to well foundations.

## Shelter for Staff

400. The extra accommodation for Officers and Subordinates at *Rupar* was completed, and also some extensions to the workshops rendered necessary by the increased space required, in order that the locomotives and rolling stock engaged on the Canal and Nalagarh Railways may be properly repaired.

## Buildings.

401. The whole of the buildings in the Division were maintained in proper repair.

## 402. Main channel—

## Quantity of earth-work executed.

				<i>Cubic feet.</i>	
Actual quantity excavated during year	...	...	...	46,381,190	
Total	"	"	up to date	...	214,408,894

The quantity excavated during the year in main channel is about 3,000,000 cubic feet less than in the previous year, though the actual quantity excavated in the Division throughout the year is about the same. The locomotive incline on the left bank has worked steadily throughout the year, and

## IRRIGATION.

## SIRHIND CANAL.

the earth-work in the 2nd mile and part of the 3rd mile has been taken out down to the level of the tow-path by it. The incline on the right bank was only started shortly before the close of the year. The drainage cuts to the river have been deepened, and have proved a decided success; the miles affected by them are easily kept dry, and the influx of free labor on to the works during the latter part of the year was considerable. An attempt was made before the rains of last year to obtain a supply of labor from Oudh, where scarcity at the time prevailed, but the experiment was unsuccessful, as the men, though brought on to the works and kindly treated throughout, were from the first discontented, and after a short time decamped in a body.

Drainage cuts successful.

Importation of labor from Oudh.

Small quantity of work performed, and cause.

403. There was little work executed under this head during the year, as the alignment for the diversion cuts cannot be permanently decided until the sites of the masonry works are definitely fixed.

Quantity of work performed by Prison Labor.

404. The whole of the jails were completed, and the buildings kept in repair. The prisoners have worked steadily and well both on the locomotive inclines and with the basket-work on the 3rd mile. Of the total amount of earth-work executed during the year, 16,948,622 cubic feet were excavated by prison labor.

Discharge of Sutlej.

405. The results of discharges taken of the River Sutlej at *Rúpar* were as follow :—

16th April	1874	...	...	...	...	4,891 c. ft. per sec.
23rd July	"	Flood	...	...	...	97,469 "
3rd September	"	"	...	...	...	32,446 "
11th October	"	...	...	...	...	7,417 "
19th December	"	...	...	...	...	4,225 "
19th January	1875	...	...	...	...	3,613 "

## 2nd Division.

406. This Division comprises the completion of the main line of the canal down to the bifurcation of the branches.

Harron syphon.

407. The Harron syphon was nearly completed, and was expected to be finished before the commencement of the rains, and the waters of the nallah passed through it. The work was somewhat delayed by a scarcity of bricks. Two road bridges were in progress, one at *Garhi Tarkhán*, and the other at *Rámpur*. The former was complete to bed level, and a supply of stone from the *Nálagarh* quarries was awaited to proceed with the superstructure. The foundations of the latter were about half completed at the close of the year. Sites for several more of the bridges had been definitely fixed, and detailed estimates with drawings were under preparation, many of which have been since submitted and sanctioned.

Garhi Tarkhán, Rámpur, and other bridges.

## IRRIGATION.

408. A first class inspection bungalow was completed at *Mánpur*. The existing buildings were kept in good repair.

SIEHIND CANAL.  
Buildings.

409. The following quantities of the principal building materials were collected during the year :—

Materials collected.

				<i>Number.</i>
1st class bricks	...	...	..	300,736
2nd „ „	...	...	..	82,130
Half-burnt „	...	...	..	119,858
				<i>Cubic feet.</i>
Broken bricks for soorkhee	...	...	..	12,512
Kunkur	...	...	..	11,090
Kunkur-lime	...	...	..	17,593
Shingle	...	...	..	12,000

Received from Railway and Materials Division—

				<i>Cubic feet.</i>
Pattarheri kunkur	...	...	..	69,222
„ „ dressed	...	...	..	6,240
Nálagarh stone	...	...	..	23,184

410. Of the total length of this Division (28 miles), 22 miles are completed and 5 miles actually in progress. The portion above the Grand Trunk Road is very nearly complete to its full section. The *Ráipur* hill has been cut through by the aid of small wagon roads, and at the close of the year only a little dressing of slopes remained to complete this heavy piece of cutting. On the other mile in which work is in progress the trimming of the bed of canals is being proceeded with. The total amount of earth-work excavated during year was 24,776,777 cubic feet.

Quantity of earth-work excavated.

411. The completion of the Chamkaur Escape Channel has been proceeded with, and 1,807,000 cubic feet were excavated during year. On the Katlaur drainage cut 174,750 cubic feet only were excavated. The connection of the several ponds behind the spoil-banks, between the 13th and 16th miles, in order to equalize the height of the water and prevent an excessive pressure on any one point of the bund, was proposed and sanctioned, and the work was expected to be so far completed before the rains that the result of the experiment might be tested.

Chamkaur Escape Channel and other drainage works.

412. Those portions of the spoil-banks which have been already planted appear to be succeeding well, and preparations were being made for the completion of the planting.

Plantations.

413. This Division comprises the whole of the Canal Railway from *Rúpar* to the junction with the Sindh, Punjab and Delhi Railway, the *Nálagarh* Extension, the siding to the *Pattarheri* block kunkur quarries, as well as the collection and distribution of materials from *Nálagarh*, *Pattarheri*, *Kerithpur* and other places above *Rúpar* on the River Sutlej. This Division was only constituted from 1st February 1875, having previously formed two Sub-divisions of the 1st Division of this Canal.

Railway and Materials Division.

## IRRIGATION.

## SIRHIND CANAL.

Opening of Nālagarh  
Railway.

414. This extension of the Canal Railway was opened for traffic on 5th March 1875, on which day the first load of stone from the quarries was delivered at *Rūpar*, and since that date the traffic has been continuous. Every effort is being made to deliver a sufficient quantity of material on the 2nd Division to allow of the masonry works being proceeded with uninterruptedly during the rains, when the traffic on the railway is stopped; and from the progress already made there is good reason to expect that this object will be achieved. A large quantity of stone has also been delivered at the Head Works at *Rūpar*, where it is being dressed and prepared for use in the dam, &c. The quality of the stone is excellent, and makes very good work.

## Collection of materials.

415. The collection of boulders at *Kerithpur* is nearly completed, as the tramway has been carried as far up the nallah as it can be worked with satisfactory results. The out-turn of stone from the *Ghumsole* quarry improves both in quantity and quality as the face is opened out, but much more remains to be done before the maximum out-turn is reached. Little or no kunkur has been quarried at *Pattarheri* during the year, as there is a large supply already on the ground awaiting removal. Kunkur has been delivered by the Canal Railway to the different masonry works, both on the 1st and 2nd Divisions, as required. The collection of materials was—

				Cubic feet.
Boulders	...	...	...	.. 326,400
Block kunkur for lime-burning				.. 1,641
Nālagarh stone	...	...	...	.. 310,940
Soorkhee	...	...	...	.. 14,971
Fire-wood	...	...	...	.. 137,103

Some bricks and soorkhee materials have been burnt, and a large flame-kiln for lime-burning constructed at the Head Works.

## Maintenance of Railway.

416. This has been successfully carried out during the year, the line is in good order, and the maintenance per mile shows a satisfactory decrease from the cost of the previous year. A further saving is expected under this head during the current year.

## Accounts Division.

417. The formation of this Division has worked most satisfactorily. The transfer of the whole of the accounts of the Main Line to one Central Office has very much accelerated the prosecution of the works, as the Executive Engineers in charge of the Divisions are thereby enabled to devote a much larger portion of their time to the actual works in progress. The supply of materials to the different masonry works has also been greatly accelerated, as the large transfers necessary

from the accounts of 1st Division to 2nd Division of the enormous quantities of building materials, such as are now being delivered by the Railway and Materials Division to the masonry works in progress, would have occupied a very considerable portion of the time of each Executive Engineer, and thereby rendered the time he could give to the actual supervision of works in progress proportionally shorter.

IRRIGATION.  
SIRHIND CANAL.  
Accounts Division.

418. This Division comprises part of the Abohar and Bhattinda (British) Branches of the Canal.

3rd Division.

419. The detailed estimate and drawings for the first masonry work on this Division, viz., of the bridge for the *Mdler Kotla* road, were prepared, and have since been submitted and sanctioned. The inspection bungalows were pushed on, and they were expected to be ready for occupation before the commencement of the rains. A large quantity of building materials were collected, and brick-manufacture had been pushed on vigorously. The progress was as follows :—

Progress on works.

1st class bricks	...	...	...	2,910,392	Number.
Bricks for soorkhee	...	...	...	549,627	Cubic feet.
Kunkur for lime-burning	...	...	...	22,532	"
Kunkur-lime	...	...	...	5,342	"
Fire-wood	...	...	...	943,242	"

420. The earth-work on this Division was only commenced quite towards the close of the year. About seven miles of the channel on the Combined Branches and on the Abohar Branch were put in hand with a large body of laborers procured from the districts west of the Ghaggar river where a partial scarcity prevailed. Fair progress was made. As the greater portion of the work on this Division has hitherto been only on surveys and collection of materials, the actual progress on works is not very large ; but, as every preparation has been made for pushing on the works, the next year's progress may be confidently expected to show a very considerable increase.

Earth-work.

421. The surveys and levels for the final location of the Bhattinda Branch were in progress, and fieldwork completed. Operations extended over an area of about 100 square miles.

422. This Division forms the connecting link between the Main Line (1st and 2nd Divisions) and the 6th Division of this Canal ; it also includes the Kotla Branch. As the Division was only constituted on 1st January 1875, the progress to be reported lies mostly in survey work.

5th Division.  
Extent of Division.

423. Thirty-one miles of centre line have been laid out and permanently levelled ; mark-stones having been fixed at every 500 feet for 17 miles. The trial lines and levels for the permanent alignment of the Kotla Branch were carried on over an area of 400 square miles.

Survey work.

IRRIGATION.	424. Arrangements have been made for the manufacture of bricks, and for the collection of building materials generally. Three of the temporary quarters and one of the permanent inspection bungalows have been commenced. Two of the former were well forward, and were expected to be ready for occupation before the rains.																																
SIRHIND CANALS.																																	
Collection of materials and provision of shelter for staff.																																	
6th Division.	425. This Division is the continuation of the Feeder Lines from 5th Division, and also includes the <i>Patiala</i> navigation channel, as well as the works for the improvement of the <i>Patiala</i> city.																																
Extent of Division.																																	
Progress made in execution of masonry works.	426. Two bridges were commenced, one at <i>Hirabagh</i> , and the other at <i>Sandwar</i> , both in connection with the works round the city of <i>Patiala</i> . Good progress was made, though a good deal of difficulty was experienced, in getting down the wells for the foundations, owing to the variable strata of the ground at the sites.																																
Shelter for staff.	427. The whole of the temporary quarters on this Division are either completed or in progress. Of the permanent inspection bungalows four are completed and two more in progress.																																
Collection of materials.	428. The manufacture of bricks has progressed steadily during the year, though not so quickly as could be wished, owing to the difficulties experienced in obtaining a regular supply of fuel. The progress reported is as follows :— <table><tr><td>Bricks</td><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>4,038,758</td><td>Number.</td></tr><tr><td>Lime-stone</td><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>107,407</td><td>Maunds.</td></tr><tr><td>Kunkur</td><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>45,070</td><td>Cubic feet.</td></tr><tr><td>Soorkhee</td><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>3,235</td><td>„</td></tr></table>	Bricks	...	...	...	...	..	4,038,758	Number.	Lime-stone	...	...	...	...	..	107,407	Maunds.	Kunkur	...	...	...	...	..	45,070	Cubic feet.	Soorkhee	...	...	...	...	..	3,235	„
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Soorkhee	...	...	...	...	..	3,235	„																										
Scarcity of labor for this work.	429. The work in progress was in excavation of part of the 3rd Feeder of the Canal and the <i>Patiala</i> Escape Works. There was great scarcity of labor, and what was available came mostly from other districts and territories. The contractors employed have experienced very considerable difficulties in getting men to execute the works, and in keeping them even when obtained, although advances had been made. The escape works were so far completed that it was anticipated a portion of the flood-water during the rains could safely be passed down the new channels. The amount of earth-work excavated during the year was 11,499,761 cubic feet.																																
Surveys.	430. A considerable amount of surveys and levels were executed during the year, mostly in connection with the <i>Patiala</i> city improvement works.																																
INVESTIGATIONS FOR NEW PROJECTS.																																	
Swat River Canal Project.	431. This project was submitted in the previous year ; no further progress has been made pending orders for proceeding with the works.																																
Project submitted.																																	



432. On the return of the Officers from the Famine Relief Works in Bengal, another attempt was made to carry out the surveys and levels required for the completion of the detailed designs and estimates for that portion of the Lower Bári Doáb irrigation which has been sanctioned by the Government of India. In connection with this scheme 105 miles of connecting levels and 454 miles of cross sections were run; 47 miles of survey for the head channel and 64 miles of survey of the right bank of the River Sutlej (the latter being still in progress at the end of the year) were executed. Contour lines were laid down, and 37 miles for lines of the distributaries derived therefrom, were in course of being surveyed and have been since completed. In the opinion of the Superintending Engineer sufficient information for the preparation of the estimates would be completed by the end of the working season.

IRRIGATION.  
INVESTIGATIONS FOR  
NEW PROJECTS.

*Special Survey Division Lower Bari Doáb.*

Work performed.

433. The detailed project for this work has been submitted, and is now under the consideration of the Chief Engineer.

*Rechna Doáb Irrigation.*

Project submitted.

434. The following discharges of the River Chenab were taken in connection with this work with results :—

Discharge of Chenab.

				<i>Cubic feet per second.</i>
22nd December 1874 at Pul	...	...	...	3960
30th " " "	"	"	...	3572
22nd January 1875 " "	"	"	...	3610

As at this point the river does not all flow in one channel, some further observations were taken higher up the stream—

28th December 1874—About two miles above Aknúr  
gauge channel, about 300 feet wide, banks almost perpendicular } 4364 c. ft. per second.

29th December 1874—Just above Aknúr gauge 4523 c. ft. per second. The section at Pul next day showed only a discharge of 3572 cubic feet per second, and the difference may be taken approximately as the discharge of the effluents at *Bijwát*, a detailed survey of which locality was completed. The progress in connection with this project was—

341 miles levelled ;

195 „ surveyed ;

78.59 square miles area contoured.

435. The preparation of this scheme has been continued during the year. A survey of the River Ravi was made, and levels taken both on the right and left banks. Borings have been taken for the purpose of ascertaining the cost of foundations, should the weir be built at the head of the Sidnai at *Tolamba*. The information obtained is considered to be sufficient for the preparation of the project estimate. The work executed was—

*Canal from the Ravi near its Junction with the Chenab.*

Investigations made for preparation of project.

112 miles levelled ;

83 „ surveyed ;

700 square miles contoured.

<p>IRRIGATION.</p> <hr/> <p>INVESTIGATIONS FOR NEW PROJECTS</p> <p><i>Derajat Circle, Special Survey Division.</i></p> <p>Embankment to pro- tect the Muzaffar- garh District.</p>	<p>436. Little survey work has been done during the past year, as, owing to the transfer of Officers to Bengal for the Famine Relief Works, the staff of this Division was very much below its proper strength, and the only work in progress was the embankment of the River Indus to protect the northern portion of the <i>Muzaffargarh</i> District. These works were, on the whole, very successful, though, owing to the extremely high floods in the Indus, the banks were breached in three or four places; the highest flood on the 10th August 1874 rose two feet higher than the highest known flood-marks as ascertained from the local authorities. The embankments stood well, except in those places where the breaches occurred, and these were mostly due to the bad class of soil obtainable. The flood of the 10th August 1874 threatened at one time to extend to the town and station of <i>Muzaffargarh</i>, the floods being six feet deep at five miles from that station, where they crossed the road to <i>Dera Ghazi Khan</i>.</p>
<p>Temporary shelter for staff.</p>	<p>437. Some temporary shelter was run up for the subordinates engaged on the works, but the time was too short to make more than the roughest description of shelter.</p>
<p>Provision of regulators for inundation canals.</p>	<p>438. The embankment crosses many inundation canals and water-courses, the greater number of these had to be entirely closed during the floods, and the irrigation suffered in consequence. Estimates for regulators to the most important of these channels have since been submitted and sanctioned. Materials were being collected, and the works pushed on as rapidly as possible, and it was anticipated that most of the regulators would be finished before the July floods.</p>
<p>Extension of embankment.</p>	<p>439. Surveys and levels were taken for the extension of the embankment some twenty miles higher up the river, so as to shut off the floods to the north of the city of Leiah. The ground for the extension southwards was also examined as far as could be done with the staff available for this work.</p>
<p>Amount of earth-work executed.</p>	<p>440. The amount of earth-work executed on the embankments during the year was 45,750,995 cubic feet. The difficulty of obtaining labor was very great; and as the works had to be commenced at the most important points which were scattered along the whole length of the line, the work of supervision was a very difficult matter, and the distances to be travelled by the Officer in charge were necessarily very long.</p>

## PART IV.—RAILWAYS.

### GUARANTEED.

#### SCINDE, PUNJAB AND DELHI RAILWAY.

#### GUARANTEED.

441. The Capital of the Company bearing interest is ~~Rs~~ 12,08,20,949, and, after deducting the net profits for the year, ~~Rs~~ 25,33,890, for 1874-75, from the interest, ~~Rs~~ 60,35,442, payable under the guarantee, the result is a net loss to Government of ~~Rs~~ 35,01,552.

Capital of Railway.

442. There has been an increase in the number of passengers in all classes, which results from the extension of the Lahore local train from Amritsar to Jullundur, and an additional fast passenger train with reduction of fare in the 3rd class in Scinde.

Passenger traffic.

443. The causes that have influenced the goods traffic are—alteration of gauge for the Indus Valley, whereby less material was received for transport; less Ordnance and Government stores carried; and a reduction of the grain traffic over the whole line.

Goods traffic.

444. The Sutlej bridge was restored and opened for traffic on the 2nd May, and, with the completion of the girder bridge on Sirhind Valley, the permanent communication between Lahore and Ghazeeabad was established on 12th June.

Restoration of Sutlej Bridge.

445. The stone protections to the piers of large bridges have been satisfactorily reported on.

Stone protection to piers of bridges.

446. At Saharunpore, a workmen's institute, three blocks of barracks, and a house for the Assistant Locomotive Superintendent, were completed.

New works.

447. New workshops have been erected at Lahore. The erection of an oil-mill is in progress.

448. Two hundred and fifty covered goods wagons and five postal vans have been added to the stock, and the following

Additions to rolling stock.

GUARANTEED.

Additions to rolling stock. have been constructed for the Punjab Northern State Railway :—

Composite	...	...	...	2
Second class	...	...	...	1
Third class	...	...	...	20
Low-sided	...	...	...	40
Covered goods	...	...	...	20
				—
			Total	... 83
				—

449. The lighter axles of the goods wagons are being replaced by stronger ones, and the carrying power increased from 6 to 10 tons per vehicle.

Fuel.

450. Coal is now used for fuel as far as Lahore, and it is proposed to extend its use as far as Mooltan. Serious damage has been caused to the engines in Scinde by the supposed action of the acid in the wood fumes, and wood was abandoned as fuel in March last.

451. The branch line from Mooltan to Rājghāt was taken up, and the land restored to Government.

Telegraph.

452. A third line of telegraph between Lahore and Ghazeeabad has been commenced.

STATE.

## STATE RAILWAYS.

## PUNJAB NORTHERN RAILWAY.

State of works at close of last year.

453. At the commencement of the year the progress made in the construction of the large bridges, and of the works of this Railway generally between Lahore and Jhelum, was as follows :—

Bridge mile 2.

454. At bridge, mile 2, (3 spans of 12 metre girders), over the back-channel of the River Ravi, the pier foundations had been sunk, half of the protective flooring executed, and abutment foundation wells commenced.

Ravi Bridge.

455. The large bridge over the River Ravi (33 spans of 90 feet) had all its brick-work nearly completed, 8 spans of its girders riveted up, and preparations for the erection of all these girders well advanced.

Palku Bridge.

456. The Palku bridge (9 spans of 12 metre girders) was ready for the girders.

## STATE.

457. On the Chenab bridge (64 spans of 40 mètre girders) the well foundations were completed, and the brick-work superstructure of piers and abutments was well advanced. The delivery of the girders had begun on the ground, and craneways and staging for their erection were under active preparation. Chenab Bridge.
458. The brick-work of the Bhimbar nallah bridge (20 spans of 12 mètre girders) was ready for a mètre gauge railway. Bhimbar Bridge.
459. At Jhelum bridge (50 spans of 90 feet) all the well foundations, except those for pier No. 40, were finished, as also 90 per cent. of the brick-work superstructure for piers and abutments. Jhelum Bridge.
460. With the exception of the bridges as detailed above, the works generally for a mètre gauge railway from Lahore to Jhelum were in a state to receive the permanent-way. Works generally for  
Mètre Gauge.
461. Early in the year under report (1874-75), orders were issued to lay the mètre gauge line on the road between Shahdara and Wazirabad, and to complete the works with as little expenditure as possible, so as to utilize the work already executed. At the same time the construction of a new embankment for a 5' 6" gauge railway, separate from the trunk road, was authorized. Progress 1874-75,  
Mètre Gauge.
462. At the end of May 1873, platelaying for the mètre gauge line had reached the 13th mile, and a trackway from the 57th mile (Dhonkal brick-field) to the south bank of Chenab for the use of bridge-works had for some time existed. In August, 62 miles had been linked in, and a continuous mètre gauge line was available from Lahore to Chenab, crossing the Ravi on the temporary timber-bridge. Preparations for  
opening platelaying.
463. The ballasting was then proceeded with, and 516,000 cubic feet spread, most of which had to be led by train from Lahore. By the middle of March 1874, all the works necessary under the existing orders for opening the line were in readiness. Ballasting.
464. The line was inspected by the Consulting Engineer to Government of India for Guaranteed Railways Lucknow on the 11th, 12th, 13th and 15th March 1875; and, to permit the carrying out of various additional works then considered essential to public safety, the 12th April was fixed as the date of opening to the public. Inspection.
465. Station sidings were retarded for some time by a want of switches and crossings. Station sidings.

## STATE.

## Stations, &amp;c.

466. The Stations, Booking Offices and other buildings between the Ravi and Chenab were put in repair and equipped. Terminal engine-shed and locomotive staff quarters and latrines built; ash-pits and watering, engine reversing, and all other arrangements as quickly pushed on with as delays in the receipt of signal, fencing, and other stores material, as well as of the telegraph apparatus, would permit.

467. It had been till January intended to open the section for public traffic from Shahdara Station on north side of the Ravi; but the unavoidable delays which had prevented the earlier completion of all the necessary arrangements had by that date so far advanced the works on the Ravi and back-channel bridges as to show an immediate opening from Lahore to be practicable. Orders were therefore received early in February from the Director to erect a temporary terminus at Lahore.

468. There was then accordingly immediately put in hand a variety of works for passenger and goods accommodation, which, from the present limited and awkward nature of the yard area available, and its being constantly blocked by the large quantities of bridge and other heavy material in course of transport up the line, was necessarily difficult of execution.

469. These works consisted chiefly of passenger main line sidings and lye-bys, with platform, Booking, Telegraph, and other Offices, and sheds, latrines, &c., and also of two goods platforms, and their lines, sheds and offices for transfer of through goods, and receipt and delivery of local goods, &c.;—all these, with turn-table, points, signals, &c., were in little more than one month practically completed.

## Bridge mile 2.

470. At this bridge great difficulty was experienced in sinking its numerous foundation wells and protective curtain blocks so close together. These blocks being square, and their flat curbs without cutters, took an unexpected amount of time and labor in sinking through the tough silt lying below the sandy bed of the nallah.

471. The brick-work of abutments and piers was, however, completed, and the girders (strengthened for broad gauge weights) were erected in time for the inspection.

## Ravi Bridge.

472. The erection of the girders was commenced in March 1874. By the 24th of July they were all carried out from Lahore, riveted together, and lifted into place on the piers. The work then stopped until October, when orders were received enabling the cross girders and rail-bearers to be riveted in place. This was finished in November, progress being then again delayed pending orders.

## STATE.

## Ravi Bridge.

473. In January 1875 authority was received to carry out arrangements fitting the bridge to carry temporarily the mètre gauge line, and at the same time permitting the light broad roadway to be laid down. Before the former measure could be effected, the flooring plates already loosely in place had to be taken to the shops and 25,000 fresh holes drilled, in order to proceed afterwards with that for the 5' 6" gauge without interruption to traffic.

474. The bridge was tested on the 13th March with satisfactory results.

## Chenab Bridge.

475. During the last floods, which were not in any way exceptional, the main stream of the Chenab, by an unexpected action of the currents on the central island immediately above the bridge, was diverted towards north bank, and thence by the rapid formation of a sand bank in the line of the piers, forced into a course parallel and close to them for nearly two-thirds of the waterway width. At this point the volume of the stream was suddenly turned downwards, and took the adjacent piers with its whole scouring force obliquely as well as vertically. The piers successively attacked till the flood abated were Nos. 46, 47 and 48, and in each of these the upstream and central wells were unrooted and overturned bodily. These wells had no superstructure on them, but were belted with iron at their summits, concreted and quite finished. They had been sunk into the clay substratum to more than the prescribed depth, being about 70 feet below low water level, but it had not been possible to surround them with the quantity of stone armour rendering each pier complete. As the wells fell away from the stream current, which was nearly from north to south, the northern side of the emplacement of each pier was left clear of obstruction, while the southern was blocked. The new pier wells have been therefore sunk on the northern side of the former sites, with the result of shortening the 46th by 21 feet, and lengthening to the same extent the 49th span, while the 47th and 48th remain of the same width.

476. The girders of the 46th span will be shortened on the ground, and those of 159 feet,  $\frac{1}{4}$ th inch clear bearings, for the new 49th span, have been ordered from England, and are expected on the ground by September.

477. To replace the lost piers it was necessary to form massive islands, chiefly of sand-bags, in the current, on the new sites, and to sink the wells through them. The brick-work of these wells is now finished, and the last lifts are being sunk. They will be all bottomed by the end of April, and each protected by 30,000 cubic feet of filling soon afterwards.

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**STATE.****Chenab Bridge.**

478. With the exception of the superstructure of these three piers, all the brick-work of the Chenab bridge is finished.

479. Of 64 spans, 49 spans of the girders have been fixed in place, leaving 15 spans only for next season's work. Of the 49 spans in place, 40 form a continuous length on the north, and 9 on the south side of the river.

480. Unless operations now in progress on the island in the river bed should turn the side-long channel above described, and which still exists, in gradually working towards south abutment, and form, as originally intended, a sand bank there, the erection of these 15 spans next season will require expensive piling and cause considerable trouble.

481. These operations have for their object to guide the river directly through the bridge, and are the complement of the training works already executed, and now successfully acting. They consist of a cut through the central island already referred to as having caused the accident during last floods.

482. By the execution of this cut the removal of about 45 lakhs of earth-work to be used in new line bank and Haripur training works bund is provided for, but this work could not be set about on the large scale necessary till towards the end of February. At that date 80 new wagons and 2 locomotive engines were delivered on the ground; tramways to and from the banks of upwards of 12 miles in length were laid; and every possible activity has since been shown to have the whole executed before the end of May, when the river bed is generally submerged. There is every reason to believe that a 150 feet wide canal, which is upward of 5000 feet in length, as also the two embankments for which it has provided the soil, will be before that time finished.

483. During the progress of the girder-erection one accident only occurred. This was on the 21st of July last, when a high flood suddenly submerged the ground on which some of the girders were being riveted up, and by scouring out the piles of the staging overturned those of the 59th span into the river. All the iron-work has been, however, subsequently recovered and again put together.

**Jhelum Bridge.**

484. All the work in piers and abutments has been completed.

485. The whole of the girder iron-work has been delivered on the ground, but has been found so defective as to require heavy and tedious repair. The repair is confined chiefly to the struts and their connections with top and bottom



## STATE.

## Jhelum Bridge.

booms, but seriously affects 29 out of the 50 spans. The erection of the bridge has been therefore deferred until these repairs are carried out, and the strengthening yet to be determined on for light or unrestricted broad gauge loads has been also given.

486. This repair and the strengthening of all the spans for light broad gauge traffic, if this be limited to that already adopted on the Ravi, could be completed, as well as the girders in place and ready for an extension of the metre gauge line to Jhelum, by the end of the year now entered in.

487. In training works to large rivers matters now stand as under—

## River Training Works.

488. On the *Ravi* the sluices at Mahmúd Búti were put in efficient working order in April 1873, and the spoil-bank forming part of the continuous bund between them and Shálimár was widened, and the breach in it repaired in July last. These training works, in so far as all those designed for the left or Lahore side of the river are concerned, are now therefore complete. In this state they have not been subjected to test, as the floods of the season were under the average height. On the right, or Shahdara bank, some protection is still required at the corner of the enclosure to Jáhángír's tomb. Of this the nature and extent is now under consideration.

489. On the *Chenab* these works have been carefully maintained, and throughout the floods have continued to act satisfactorily. The extension of the Haripur bund to its junction with south abutment of the bridge, for 3000 feet in length on the line as originally designed, is now being made up from the excavation on island in the bed of the river, and will be finished before the river again rises.

490. On the *Jhelum* the outward slope of the Kotea spur, which protects the south or Naurangabad bank above the bridge abutment, has been well faced with boulders. This spur has done its intended duty well during the past year. The river is now running well towards the centre of its bed, and causes no further apprehension.

491. *Ravi Bridge*.—During the year 300,000 cubic feet of concrete blocks have been placed round piers and abutments, making a total of 857,292 now in place. The total sanctioned quantity is 1,289,200, and that deposited and in reserve before the river rises will far exceed the minimum prescribed.

Protective filling round Piers and Abutments of large Bridges.

492. *Chenab Bridge*.—Extensive arrangements have been here made for the required immediate supply of boulder filling and concrete blocks. The total sanctioned quantity is

## STATE.

Protective filling  
round Piers and  
Abutments of large  
Bridges.

2,570,000 ; that actually laid down to end of year is 1,283,744 ; while there is in addition already a reserve stock of 100,171 cubic feet.

493. The 1,608,000, prescribed to be deposited and available by 30th June next, will be very considerably exceeded.

494. In most cases the filling laid down last year was not disturbed, and this season's supply has been piled on top until the mass nearly reaches the girders and hides the piers from view.

495. Nothing more can be in such cases added until the subsidence of the present quantity. By means of the continuous girders in place at each extremity of the bridge, and a double line of tramway for heavy trollies on those from north bank, while the engine runs on those from the south, all the piers can be reached during next floods for the supply of the reserve filling in the event of scour, except those from 41 to 54 inclusive, on which the girders have not been yet erected. These will be then inaccessible, as boats cannot venture near them. For each of these 14 piers it is therefore intended to give the full sanctioned quantity of 30,000 before the 30th June. Should the scour caused by the side-long channel not, as is expected, have left a deeper pit for them than can be effected elsewhere by dredging, this mass will be piled up over the wells. The new piers, it may be observed, are already tolerably well protected by their artificial islands enclosed in sand-bags.

496. At *Jhelum* a total quantity of 500,296 cubic feet of boulder protection has been laid round the piers and abutments of *Jhelum* bridge (the total quantity sanctioned being 530,000 cubic feet). In no place has the filling previously deposited been seriously disturbed during the last floods.

Minor Bridges.

497. As already noted, the Ravi back-channel bridge, mile 2, has been completed with its girders strengthened for broad gauge loads and in use on the open line since 15th March.

Timber Temporary  
Bridge over Ravi.

498. The timber temporary bridge on the Ravi was put in repair immediately after the autumn floods, and was ready for engine traffic by 16th October. Since that date it has efficiently served for the transport by train of large quantities of girder iron-work and other materials of construction of the works beyond ; on an average five of these material trains having been run over it weekly during the last five months.

499. All the other bridges between *Shahdara* and *Gujránwála* were bedded on timber and sleepered for the metre gauge line in June and July.

## STATE.

500. The *Palku bridge* (mile 61) has been for some months in use for metre gauge material trains. Its girders will be strengthened for broad gauge line during the rains, when the works traffic is slack.

Palku Bridge.

501. The piers and abutments of the *Bhimbar bridge* (spans 20 of 12 metre girders) are now being re-built to greater width for the new line, and it will be ready with its strengthened girders for an extension of the open line at the same time as the Chenab bridge.

Bhimbar Bridge.

502. The Chickori iron flood gap bridge (at mile 80½) on trunk road line has been dismantled, and its iron-work is being re-erected for the same waterway on the new line alongside.

Chickori flood gap.

503. All the other bridge and special flood girder material will be immediately removed from the trunk road between Chenab and Jhelum for re-employment on the new broad gauge on the same section.

*New Embankment for 5' 6" Gauge.*

504. The surveys, land plans and preparation of the project for a separate embankment of a 5' 6" gauge railway were put in hand at the commencement of the year, and all the field-work was completed in October.

New Project 5' 6" gauge.

505. The land plans and schedules for permanent occupation were submitted to Local Government in June and July for the necessary action in taking up the land. A special Officer was then appointed, and this land was all taken over and settled for by the end of February 1875.

Land Plans.

506. For the land temporarily required the similar documents were submitted in February, and the necessary gazette notifications were issued in March. All the land will be in possession of the Railway and paid for by 15th April.

507. The project sheets showing general plan and working longitudinal section, together with alternative estimates for earth-work and minor bridges, low brick viaducts or iron girder tops, and culverts, were submitted for the approval and sanction of Government on the 9th of March 1875.

Working Plan and Longitudinal Section and Estimates.

508. The earth-work between the Chenab and Bhimbar, and also thence to Khárian Station on the Chenab Section for the new embankment to depressed gradient suitable for low openings with girder superstructure, has been commenced in

Earth-work for new bank.

## STATE.

Earth-work for new  
bank.

anticipation of the adoption of this character of structure in place of that of *brick* arched viaducts ; about  $\frac{3}{4}$ ths of that on the first distance, or of 8 miles in length, has been executed, and the remainder will be before the rains. On the rest of the distance between the Bhimbar and Khárián operations are already in hand, but great progress cannot be made till the close of harvest operations releases the local labor. From the end of the diversion through the Pabbi range, at the 98th mile, to the south abutment of the Jhelum bridge, which length is not affected by the decision on the character of bridging, and also through the cutting on this diversion between Khárián and mile 98, the works have also been started. Everything possible will be done so as to have the whole distance with its bridges ready early in 1876, and thus permit, with the completion of the Chenab bridge, an extension of the narrow gauge on it to Jhelum in March next. In this way the large bridges and other finished works beyond the Chenab will be utilized while the bridge-works between Shahdara and Wazirabad, which will require more time, are in progress.

Estimates for Perma-  
nent-way, &c.

509. The estimates for ballast, sleepers and permanent-way for 5' 6" gauge have been submitted, and those for the stations are under preparation, and will be shortly sent up to Government for sanction.

510. Since the merging of the Circle with that of the Survey extension beyond Jhelum in January, the work of preparation of all the plans, estimates, &c., for the new line, has been taken over by the Engineer-in-Chief himself.

Rolling-Stock.

511. At the commencement of the year there were on the line, of *mètre* gauge rolling-stock, three tank bogie engines class A, one first, one second, and one third class carriages, with 57 ballast wagons and 113 trollies.

512. In June two of these class A locomotives were sent to the Rajputána (State) Railway ; but by various additions this *mètre* gauge stock at the close of the year stood as follows :—

Tank Engine Class A	1	} 8 locomotives.
Bogie Engines Class B	7	
1 First, 2 composite, 2 second, and 21 third class carriages		} 26 coaching vehicles.
Brake-vans ... ..	3	
Covered goods wagons	30	
Cattle wagons	5	
Low-sided ballast wagons	161	
Trollies (light)	} 126	
Do. (heavy)		

## STATE.

## Rolling-Stock.

513. In addition to the above, there is still on the ground, and available for construction of new line, the following 5' 6" gauge stock :—

- 1 Tank Engine,
- 10 Ballast wagons, and
- 69 Trollies.

514. Of the 8 mètre gauge engines, 3, viz., 1 Class A and 2 Class B, are employed on the Chenab bridge works ; the first having been so throughout the year in the transport of materials from brick-fields, ballast depôts, iron-work, &c. ; and the two latter, since February, in the formation of the Palku and Chenab new line embankment, and of the Haripur training works bund.

515. The five new engines have been erected in the Shahdara shops, and 2 composite, 1 second and 20 third class carriages have been constructed in those of the Scinde, Punjab and Delhi Railway Company.

516. Of the 161 low-sided trucks, 104 are occupied on the Chenab river bed and general bridge-works. Eighty of the latter with additional iron-work were made up on the lower frames and wheels of covered goods in store here ; 40 with the extra iron-work of 20 in the Shahdara shops ; and 40 with the extra iron-work of 60 in those of the Scinde, Punjab and Delhi Railway Company.

517. From this Company 20 covered wagons are also immediately expected. The assistance it has thus rendered has been of much service in permitting the opening of the first section of the line, and the prompt readiness with which its Agent, Locomotive Superintendent and other Officers have responded on all points merits grateful recognition.

518. In March all the stations were put in communication with Lahore, and with each other, but the wire over the Ravi is yet carried on temporary supports only, although the brackets on the bridge are ready for them, and will be immediately made use of.

Electric Telegraph.

519. All the Signallers and Station Masters have been trained by the Traffic Department of the Scinde, Punjab and Delhi Railway, and the completeness of the arrangements for the works of stations and the telegraph, as they now stand, is due to the valuable and cordial co-operation of Mr. D. Ross, its Traffic Manager.

520. Early in the year the revised estimates for an extension of the mètre gauge railway in part occupation of the trunk road between Jhelum and Ráwalpindi then before Government were shelved, and orders received to adopt a new

Survey of Extension  
beyond Jhelum.

## STATE.

Survey of Extension  
beyond Jhelum.

line of 5' 6" gauge separate from the road for this extension, and to form a staff to carry out the surveys for it.

521. It was directed that this line should follow closely the route taken by Mr. H. P. LeMessurier's line of 1868 ; and while it was admitted that any further trial lines over the very difficult district already frequently examined must be unproductive, within reasonable limits in length, &c., of any result in improving the grades already obtained, it was at the same time considered that in following this route the ruling grade would be 1 in 70 or 75, and even assumed that 1 in 100 might be by skilful location yet arrived at.

522. Owing to the occupation of the Engineering staff not engaged on construction, and diminished by drafts to the Bengal Famine Districts, in laying out the new broad gauge line on the Ravi and Chenab Sections, little could be meanwhile done to this trans-Jhelum project till the end of 1874. One Engineer, Mr. John Gordon, 2nd grade Executive, only was available, and was for some months of the summer engaged on that portion of the distance accessible from house shelter in Jhelum, viz., between that point and Rhotás. He prepared a section over these 13 miles, but succumbed to the exposure in August, and retiring first on sick leave in India, and afterwards on furlough to England, died before he could embark.

523. A gap in the traverse through the Bakrála range, of which the records were missing, was earlier in the year mapped by Mr. Walter Foster, also since deceased while *en route* for Europe.

524. It was intended to organize a sufficient staff under experienced control for this important extension in October, but chiefly because of the sickness and retirement from duty of some of the Engineers engaged on the surveys between Lahore and Jhelum during the hot months, and to the non-return of the loans to Bengal expected, the state of preparation of the plans and estimates was not then found sufficiently advanced to permit for some weeks longer the breaking up of the Circle, and the re-posting of its members.

525. In January the return from furlough of some of our absent Engineers, and the posting to this line of others, enabled the effecting of the necessary organization, and the field was then taken under two Divisions respectively, headed by Mr. H. T. Geoghegan and Mr. Horace Bell.

526. Before operations were, however, commenced, a careful re-examination of the data available from the numerous surveys of the previous six years proved any line over this most difficult country of rugged and precipitous hills, and

## STATE.

Survey Extension  
beyond Jhelum.

deep cross ravines, to whatever length extended, and with anything like reasonable works, to be impracticable with a better ruling grade than 1 in 50. Orders were therefore received in carrying out a combination of Mr. LeMessurier's line as far as mile 123 with Mr. Geoghegan's of 1869 from that point on to Ráwalpindi, to obtain the best line possible with a ruling grade of 1 in 50 ; but to submit the project, also at the same time showing the reduction of amount and cost of works which would follow the adoption of 1 in 40 at the two extremities where the obstacles to be got over are greatest, that is, across the valleys of the Bakrála and Sohan rivers.

527. At the end of March the field-work undertaken to these ends approached completion, and the line which has been selected will, it is believed, meet with the approval of Government in connection with its recent orders.

528. Under instructions from the Director of State Railways, the valleys and ranges of hills to the north-east of the trunk road, of which little was hitherto known, have been lately reconnoitered with a view to the possibility of discovering some passage worth a trial traverse. This reconnoissance has, however, only confirmed prior convictions, and shown any attempt to improve upon the present route by Rhotás over the Bakrála ridge and stream bed to be in that direction utterly hopeless.

529. By the end of April the staff will quit the field, and should the preliminary section, which will be soon afterwards submitted for orders, be accepted, the remainder of the summer will be devoted by them to the preparation of the working plans and estimates, so that the line may be permanently staked out early next working season, and construction soon afterwards commenced throughout.

530. The reduced width of the trunk road with its bridges between Lahore and Jhelum has been kept in efficient repair, rendered at the same time more difficult by the crowding of the traffic on the 12 feet of metalling immediately contiguous to the running trains, and with one side berm only for its relief. An extensive diversion is nearly completed at Wazirabad, with the object of giving a sufficient area to the Railway Station there and of keeping the road traffic well clear of it. Another with the same purpose is now being put in hand at Gujránwála.

Grand Trunk Road.

531. At the former place a new dák bungalow is being built close to the Railway passenger office, and will be finished early in the year now commenced.

**STATE.****Expenditure.**

532. The Budget grant for the Indian expenditure of construction on this line during the year was reduced to ~~Rs~~ 20,50,000. This reduction has not merely proved admissible, owing to book credits from transfer of stores and plant of nearly completed bridges to other lines, but the same credits have enabled us to work up in the actual expenditure to close upon the regular grant of ~~Rs~~ 25,00,000. Until, however, the accounts for the year have been closed by the Controller, it is impossible to give the correct total figures, and still less these details under the final heads of accounts.

**INDUS VALLEY RAILWAY.**

533. Adhering to the plan adopted last year, this report will first describe in detail what has been done during the year, division by division, and the general results will then be summarized by districts.

534. Before proceeding to report on the works executed, it is necessary to notice some circumstances which have influenced the line generally.

**Construction of line  
on 5' 6" gauge.**

535. First, in importance, stands the decision that this railway should be constructed of 5 feet 6 inches, not of the *mètre* gauge. This conclusion was announced on 13th June, 1874, previously to which date all arrangements had been directed towards the execution of works for the lighter line.

536. The Director of State Railways paid a visit to Mooltan early in July, and, having discussed the prospects of work with the Engineer-in-Chief, the following general conclusions were arrived at :—

**Arrangements for  
carrying on works.**

537. Seeing that the heavy works on the Sutlej Bridge, and in crossing the Indus spills in the Ghotkee Division, would certainly prevent a through opening of the line to Sukkur for at least three years, there was no immediate need for pushing on the light works, extending over some 150 miles between the Sutlej River and Sukkur, which might readily be taken in hand, and completed in a single season. From Kotree to Sukkur on the other hand, there are no heavy works, excepting the Lukkee cutting, and it appeared probable that two years would suffice for completion of this section, if a full supply of funds could be obtained. There was no prospect of obtaining such a supply of money as would permit of work being pushed



on along the whole line, and the most reasonable conclusion was to stop work altogether on the portion above indicated north of Sukkur, so as to spend more freely on the works south of that place.

STATE.  
Arrangements for carrying on works.

538. The Baháwalpur and Khánpur Divisions were accordingly entirely closed, and the Staff removed, with the exception of one Assistant Engineer and a few persons to look after the materials on the line. The progress of work was checked in two-thirds of the Rehtee Division ; only such operations being allowed to proceed as could not well be stopped suddenly ; and a similar course was pursued in the Shujabad Division, until towards the close of the year, when more funds being allotted, it was possible to resume work there.

Closing of work in certain Divisions.

539. At the same time funds were supplied freely to the Kotree and Sehwan Divisions, in the hope that an opening of the line from Kotree to Sunn, about 55 miles, might be effected in June 1875.

Kotree and Sehwan Divisions.

540. As work was stopped in two out of four of the Divisions forming the Mooltan District, that District was abolished as a separate charge, the Engineer-in-Chief undertaking the responsibilities of a Superintending Engineer in regard to the works which were to proceed. The experiment however has proved inconvenient, on account of the excessive labor thrown on the Engineer-in-Chief, the commencement of active operations on the Sutlej Bridge having brought a heavier share of duty on the office of Superintending Engineer than had been experienced at any previous time. When the new financial year 1875-76, the District will be re-formed under a Superintending Engineer.

Stoppage of work in Mooltan District.

541. The new estimates for the broad gauge works were undertaken immediately after the Director's visit, and were rapidly progressing, when a check occurred, from the difficulty of instituting a comparison between the new and the old estimates, so as to exhibit the precise difference between the cost of the broad gauge line, and what the cost would have been had the mètre gauge been adhered to. This enquiry was much complicated by changes which had taken place in the interval in the limits of executive charges. It is, perhaps, to be regretted, that the investigation should have been undertaken just at that stage, as, however, interesting the information might be, it could hardly be pronounced useful in reference to the prosecution of the works ; the result has been to delay

Estimate for Broad Gauge line.

## STATE.

Estimate for Broad Gauge line.

the completion of the estimates by several months. It is necessary to mention these circumstances here, lest the Executive Staff of the line should be held to blame for unreasonable delay in producing the estimates.

Administrative constitution of line.

542. The general administrative constitution of the line has been unchanged ; there have been an Engineer-in-Chief in chief charge, three Districts presided over by Superintending Engineers, viz. :—

The Mooltan District comprising—

The Shujabad Division.

The Sutlej Bridge Division.

The Baháwalpur Division.

The Khánpur Division.

This District, as above described, has been temporarily in abeyance.

The Upper Sindh District comprising—

The Rehtee Division.

The Ghotkee Division.

The Larkhana Division.

The Lower Sindh District comprising—

The Mehur Division.

The Sehwan Division.

The Kotree Division.

And to the Indus Bridge Division, which had been held as a separate executive charge under the immediate direction of the Engineer-in-Chief, an officer with the rank of Superintendent of Works, was appointed in November 1874, to prepare a project for the bridge over the Indus.

Works executed in Shujabad Division, 0 to 50th mile.

543. The work executed during the year has consisted of 30 lakhs cubic feet earthwork, in widening out the bank for the broad gauge, which is now nearly complete, and 75,000 cubic feet of brickwork in bridges. Out of a total of 176 culverts in the Division, 102 have been completed for the board gauge, and 61 partially for the mètre gauge.

544. The principal operation of the year, however, has been the laying and maintaining of 63 miles of mètre gauge tramway on the line works of this Division, together with the construction of the requisite rolling stock, to facilitate the carriage of material for the Sutlej Bridge. The chief item is stone for protection of the foundations, brought from Chuniote, some 200 miles up the river Ravi, landed at Humdee, and carried thence over 42 miles of the tramway to Adamwáhan. The supply of this stone required for the season's operations at the Sutlej Bridge, amounted to 25,000 tons weight. Several thousand tons weight of rails for weighting wells, iron, and

timber for constructive purposes, plant and other stores have also been carried over the line. The work done in the month of March, the first in which the supply of rolling stock enabled a fair show to be made, amounted to 209,000 ton miles, and the traffic in succeeding months is likely to be heavier. The cost of carriage per ton mile, all expenses included for that month, was 3·85 pies. The rolling stock, in work at the close of the year, amounted to 5 tank engines and 70 wagons, to the number of which almost daily additions were being made.

545. About 6 lakhs of cubic feet of deodar timber in the log have been purchased during the year: 10,000 broad gauge sleepers have been sawn out, and 40,000 more purchased at the Forest Depôts.

546. In the earlier months of the year the operations were confined to training and controlling the river, and to the provision of material, plant, and other things which would be required to permit of the bridge being commenced in November. Unfortunately so much foresight as was desirable was not displayed by the Engineers in local charge, and in consequence, after the work was commenced, many essentials were found to be wanting, and considerable labor and anxiety were encountered in the Engineer-in-Chief's office in repairing the defect.

547. Six foundations, each consisting of 3 wells 18½ feet diameter, have been commenced, viz., the abutment and 2 piers on each side of the river. The first curb was pitched on the 2nd November, and the last of the 18 on the 25th February.

548. In the four of the foundations, tenacious clay has been met with at a depth of 30 feet below dry weather water-level, which is taken as the datum for vertical measurements; in the other two foundations the soil is light sandy silt, but in one of them, at 30 feet depth, a mass of trees and brushwood has been encountered.

549. The foundations have been distinguished by letters of the alphabet, commencing with A, the abutment on the Adamwahan or right bank, and terminating with R, that on the Bahawalpur or left bank. The wells have been numbered consecutively from 1 to 51, commencing with the up-stream well of each foundation. The wells that have been commenced are, therefore,—

A.	B.	C.	P.	Q.	R.
1	4	7	43	46	49
2	5	8	44	47	50
3	6	9	45	48	51

## STATE.

Works executed in  
Shujabad Division  
0 to 50th mile.

*Sutlej Bridge Divn.*  
50th to 63rd mile.

## STATE.

*Sutlej Bridge Divn.*  
50th to 68rd mile.

550. The following table shows the depth below datum which the wells had reached, and their general condition on the 31st March, exclusive of the 3 feet depth of timber forming the curb.

Foundation and wells.		Depth reached.	Remarks.
A	1	24·31	} Tenacious clay at 30 feet.
"	2	38·15	
"	3	22·7	
B	4	34·4	} Loose sandy silt, and no obstruction.
"	5	56·27	
"	6	31·14	
C	7	55·79	Do. do. do. do.
"	8	23·85	} Brushwood under No. 9, and afterwards met with by No. 8, where it reached 30 feet depth.
"	9	34·95	
P	43	29·84	} The whole of the wells on this side of the river entered a stratum of tenacious clay at about 26 feet depth, believed from the evidence of the trial wells to be about 14 feet thick. The sinking through this clay is tedious, but it will afford a great protection to wells which may not reach their full depth before the inundation.
"	44	25·91	
"	45	32·06	
Q	46	29·36	
"	47	26·65	
"	48	29·6	
R	59	23·32	
"	50	32·58	
"	51	22·81	

551. In addition to the progress in the main foundations here shown, the row of curtain blocks connecting the abutment and first pier on east side of the river has been commenced; about one-third of the work in building and sinking have been completed; the excavation also around these curtains, and the main foundation, have progressed fairly, and will soon be ready for the reception of the loose stone protection, of which 40,000 cubic feet are to be laid immediately round each foundation, and 1,30,000 cubic feet in each land span. Of the 250,000 cubic feet required on the Baháwalpur side, about 50,000 had been carried across before the end of March, and arrangements had been made to secure the remainder being carried across during April.

552. Of the necessary subsidiary arrangements connected with the work, not the least has been the construction and maintenance of a temporary timber pile bridge, 1,000 feet in length, over the water channel, to carry the trains driven by locomotives, without which it would not have been possible to transfer the enormous weight of stone and other materials and stores employed, the whole of which are of necessity collected at Adamwáhan. There was some delay in completing this bridge, owing to the want of foresight above noticed, and it was not opened until the 1st of February 1875. Changes in

the dry weather channel, and slight rises in the river, have partially endangered the structure more than once, but it has been closed to traffic only on one occasion for two days, and if it can be maintained, as there is no reason to doubt, until the 1st of May, it will have fulfilled its object for this season, and may then be dismantled to be again erected after the inundations. The whole of the timber used in the bridge has been cut with a view to its being converted into sleepers.

STATE.  
Sutlej Bridge Divn.  
50th to 63rd mile.

553. A very large amount of iron-work has been turned out at the workshops attached to the bridge. The fittings for one well curb, with its holding-up bolts and bond rings weigh 5·2 tons. Eighteen of these have been turned out. About 60 mètre gauge wagons have been erected, the iron-work for about one-third of which was made here. The iron straps, bolts, &c., for the timber bridge formed a heavy job; and, of course, in connection with a work of this sort, there is an unceasing demand for miscellaneous articles of plant and for repairs, all of which must be satisfied on the spot.

554. A large quantity of plant was received in transfer from the Punjab Northern (State) Railway; and it is necessary to mention that the steam machinery was so worn as to be very defective, and cause infinite trouble and disappointment.

555. The training operations in the river have proved very successful. By means of lightly constructed spurs of brushwood, coarse nets, anchored below and floated above by empty hogsheads, and other similar temporary and inexpensive expedients, the stream was driven during the inundations to the centre of the channel, and has been maintained in that position, in a nearly straight course for some 6 or 7 miles, during the whole season. The operations have been very well conducted, and afford a fair promise of permanent success, provided a zealous watch be maintained.

556. As above noted, these two Divisions were entirely closed after the Director's visit in July. In the early part of the year, in the Baháwalpur Division, 16,000 cubic feet of concrete and masonry had been executed. Of the 185 culverts required in this Division, 177 had been completed for the mètre gauge as far as the instructions in force permitted. In the Khánpur Division, 1,47,500 cubic feet had been executed, completing, as far as was possible for the mètre gauge, 121 out of the 145 culverts required in the Division.

Baháwalpur Division.  
63rd to 122nd mile.

Khánpur Division.  
122nd to 172nd mile.

557. The heavy inundations of the past season have had considerable effect in retarding the works in the Divisions forming the Upper Sindh District, and they were still further impeded by the want of funds adverted to above.

Rehtee Division.  
172nd to 221st mile.

## STATE.

*Rehtee Division.*  
172nd to 221st mile.

558. In the Rehtee Division, 72 lakhs of cubic feet earth-work were thrown up in widening the bank for the broad gauge, and there is every prospect of the banks being completed before the inundations of this year.

559. 50,000 cubic feet concrete, and 96,000 cubic feet brick-work, have been built, in 13 culverts completed, and in 17 other culverts commenced, during the year.

560. 13,000 cubic feet of concrete, 2,500 of brick-work, and 105 lineal feet of well sinking, have also been executed in the following larger bridges, which are in full progress :—

47 ... ..	25 arches of 10 feet.
64 ... ..	5 " 10 "
65 ... ..	5 " 10 "
66 ... ..	5 " 10 "
79 ... ..	13 spans of 40 feet girders.
84 ... ..	10 arches of 10 feet.

561. A supply of 60 lakhs of sand moulded bricks for building has been manufactured by Messrs. Collins and Petman, Contractors, and some 20 lakhs of slop moulded bricks, suitable for ballast, for concrete, have been made departmentally.

562. The great difficulty hitherto in this part of the country has been the want of labor for pounding soorkee. Arrangements have been made for the supply of machinery for this purpose.

*Gholkee Division.*  
221st to 270th mile.

563. Waiting for instructions to be issued on a report submitted by the Engineer-in-Chief on the effect of the last season's floods, and the suggestion that iron girders instead of arches should be reverted to, in consequence of a great fall in the price of iron, have retarded the commencement of building in this Division.

564. The Contractors have secured an outturn of 100 lakhs of bricks, and there is no reason to doubt that, the demands having been much reduced by the final proposals submitted for bridging, sufficient material may be provided during two more seasons to complete the works, without the intervention of much expensive machinery for brick-making. About 3 lakhs cubic feet of stone have also been quarried at Rohree, and prepared for building. In consequence of the demand for building bricks in this part of the line, the manufacture of ballast has been discontinued for a time.

565. The pounding of soorkee has been found a greater difficulty here than in the Rehtee Division, and arrangements have been made to provide machinery for the purpose.

566. 192 lakhs of earthwork were executed during the year in widening the bank, which is now nearly ready, and a commencement was made on the bridge over the Narra Canal. It is confidently expected that the bridge works will now proceed rapidly, and without any further check.

## STATE.

567. There has been no work done on the short length of the line in this Division during the year. An officer specially appointed by Government as Superintendent of Works to design the bridge passed some weeks at Sukkur and undertook the investigation of several matters connected with the selection of the best site.

*Indus Bridge Division.*  
270th to 273rd mile.

568. The provision of a bridge across the Indus at this place may be said to have advanced a step in the choice of site having been now limited to the alternatives of crossing opposite the point, by means of a bridge of ordinary spans, and of covering the Rohree channel by a single span of from 600 to 700 feet, the proposal to erect a bridge opposite new Sukkur having been finally abandoned.

569. The decision of Government on the memorial of the people of Shikarpur, referred to in last year's report, praying that the line might be diverted to pass through that town, was not received until July 1874. The officers then proceeded to lay out the line along the canal bank route, when a remonstrance from the Irrigation Department was received, to the effect that a much wider space than had been contemplated must be left between the canal and the railway, in view to some projected enlargement of the former. The inundations immediately succeeded, and were excessively heavy, and it occurred that the final location of that part of the line, constituting about one-third of the Division, could not be completed until quite recently.

*Larkhana Division.*  
273rd to 338th mile.

570. In the remainder of the Division, the embankment for the broad gauge has been nearly completed, 430 lakhs having been done during the year. Provision of material for bridge building to the extent of 55 lakhs of bricks has also been made during the year.

571. The work here has been confined for the most part to preparation of material; the embankment for the broad gauge has been very nearly completed, a half having been done this year; an additional 40 lakhs of bricks have been manufactured for bridge works, making 60 lakhs available; and sufficient ballast has been made for two more miles of line, completing five in all. The station buildings have been completed during the year as residences for the staff. Much more work might have been done had funds been available.

*Mehur Division.*  
338th to 391st mile.

572. The ordinary earthworks in embankments have been nearly completed for the broad gauge, but the rock cutting through the Lukkee hills was retarded, first by the doubt about the gauge, and afterwards by a new location having been to be fixed for the broad gauge line. In about a

*Schwan Division.*  
391st to 446th mile.

## STATE.

*Schwan Division.*  
391st to 446th mile.

half of the eight miles of cutting the location was uniform for both gauges ; and in this part the work could be pushed as far as the limits of dimensions required for the mètre gauge permitted ; in the remainder, however, the location depended on the admissible limit of radius for curves, and no work could be undertaken while the gauge remained doubtful. The location has now been finally marked out, and there is nothing to impede progress. The northern half of the cutting is practically completed for the broad gauge, the southern half has been fairly commenced.

573. During the year, 47 lakhs cubic feet of earthwork have been thrown up, and 68 lakhs cubic feet of cutting executed in rock. The station buildings have been completed, and the manufacture of bricks for bridge building has been brought nearly to an end. Sufficient ballast for 10 miles of line has also been collected during the year, making 13 miles in all. It was necessary to check progress in this Division for want of funds.

*Kotree Division.*  
446th to 498th mile.

574. The work done during the year amounts to 115 lakhs cubic feet of earthwork in embankments of the line, 12 lakhs cubic feet in bunds thrown up to control water-courses, 47 lakhs cubic feet of cutting for the line in rock and rocky soil, provision of 26 lakhs of cubic feet of ballast, or sufficient for 29 miles of line, and the execution of 184,000 cubic feet of masonry in minor, and 115,300 cubic feet in major bridges.

575. A sudden check occurred in the works at Christmas, when it was ascertained that the fat lime of the District combined with sand would not produce a good mortar, and arrangements for the supply of soorkee had to be made.

576. The quantities of masonry entered above, represent 117 culverts and small bridges completed, out of 168 required, and 7 large bridges well forward out of 24 required. The state of the Division at the close of the year may be roundly stated thus:—The embankments and cuttings complete ; ballast at site for 42 miles ; the culverts and small bridges nearly approaching completion ; and the larger bridges well in hand, and likely to be completed in the course of five or six months, if no unforeseen obstacles arise.

577. Delivery of creosoted sleepers and iron permanent way for 100 miles, ordered in England, has commenced, but, unfortunately, there is, at present, on sign of any fish-plate connections being likely to arrive, and there is a doubt whether points and crossings have been ordered.



## STATE.

578. The present state of this District may be summarized thus—

Mooltan District.

579. In the Shujabad Division, 52 miles long, the bank and bridges are practically ready for the reception of the broad gauge line, the Sutlej Bridge which lies at the end of the Shujabad Division has been commenced, but is not likely to be open for traffic before June 1878. Beyond the Sutlej is the long stretch of 150 miles of line, forming the Bahawalpur, Khanpur, and part of the Rehtee Divisions, on which all the works of the line required for the broad gauge might be completed in one season. Almost all the requisite material having been already provided.

580. The heavy viaducts in the lower part of the Rehtee Division, and in the Ghotkee Division, required to pass the Indus spills have been commenced, and there is a possibility of their being completed by June 1877; though it is feared they may not be ready till June 1878. The banks in this part of the line are finished, and a large stock of material has been prepared.

Upper Scinde District.

581. The three miles forming the Indus Bridge Division are quite untouched, and must so remain until the design for the bridge has been perfected.

582. In the Larkhana Division, nothing has been done along the canal bank in the first 20 miles out of Sukkur. In the remainder of the Division the embankments are nearly completed for the broad gauge, and a good supply of bricks has been provided. There are several heavy bridges in this Division to pass floods off the Indus, but, with an adequate supply of funds, everything might be completed by Christmas 1876.

583. The works in the Mehur Division are very light, but one bridge of any size is required, viz., that over the Ghar, of 3 spans of 12 mètres. The embankments have been thrown up, and there would be no difficulty in completing the line in one season, or by June 1876.

Lower Scinde District.

584. In the Sehwan Division, the embankments, north and south of the Lukkee hills are complete, and the material for the bridges is for the most part ready. The rock cutting through the Lukkee hills cannot well be completed before June 1877, by which time the other works in the Division may certainly be completed. The Sunn bridge is the only other work of importance in the Division, and, as there is nothing difficult in the nature of the foundations, it may probably be completed by June 1876.

## STATE.

Lower Scinde District.

585. In the Kotree Division the embankments are ready, the small culverts are nearly all built, the larger bridges are well in hand, and will probably be completed by September, the ballast is nearly all collected, and permanent way material is in course of delivery and distribution. There is a fair prospect of the line being opened for traffic in this Division before Christmas 1875.

## RAJPUTANA RAILWAY.

(OPEN LINE).

Agra and Delhi Districts.

586. The Rajputana State Railway is divided into two districts. The one, known as the Agra District, comprises the line which runs from Agra through Bhartpur, Jeypur and Ajmír to Nasirabad. The other, known as the Delhi District, runs from Delhi through Rewari and Ulwar to Bandikui, where it forms a junction with the Agra District at a point  $94\frac{3}{4}$  miles from Agra.

Cost of construction not referred to.

587. The two districts have been constructed under different Engineers-in-Chief and under different systems. The construction of the Agra District was let to contractors, Messrs. Glover and Co., who undertook to make the railway, being supplied with all English stores by Government, while the Delhi District was constructed under departmental management. No reference is made in this report to the cost or details of construction of the two districts, as these matters still fall within the province of the Engineer-in-Chief.

Opening for traffic.

588. On 1st April 1874 the Agra District was open from Agra to Bhartpur, 33 miles, and the Delhi District from Delhi to Rewari, 51 miles. A branch, 7 miles in length, was also open from the Delhi District to the Farukhnagar salt works.

589. In the course of the year the following extensions were successively opened for public traffic :—

			STATE.
			Opening of extensions.
<i>Agra District—</i>			
Bhartpur to Dosa	78½	20th April 1874.	
Dosa „ Jeypur	38½	12th October 1874.	
Jeypur „ Sambhar	38½	1st March 1875.	
<i>Delhi District—</i>			
Rewari to Ulwar	46	14th September 1874.	
Ulwar „ Bandikui	36½	7th December 1874.	

590. On the 7th December 1874, through traffic was commenced between the two districts, and on the 1st January 1875 they were amalgamated.

Through traffic.

591. At the commencement of the official year 1873-74, the charge of the working of the open line, as well as of the construction of the sections still in progress, rested with the Engineers-in-Chief. Officers employed in construction devoted part of their time to the charge of the locomotive arrangements, and the supervision of the Traffic Department was in the hands of an Assistant Traffic Superintendent, who exercised control over the working of the open parts of both districts. As the work on the open line increased, and further openings were imminent, it became necessary to arrange for the general management of the open line and the organization of establishments for working the traffic. Accordingly the Director of State Railways held a meeting at Delhi in July 1874, at which the strength and systemization of these establishments were discussed, and a scheme was drawn up for the first manning of the districts. In the following month the Office of the Director was moved to Agra, and the Assistant Director was placed in charge of the open sections of both districts. This arrangement continued in force till the close of the official year.

Management of open line.

592. The Engineering Department employed on the maintenance of the line remained under the charge of the Engineer-in-Chief.

Maintenance.

593. The Locomotive Department was at first supplied with covenanted drivers sent from England by the Secretary of State. As the line extended and more were wanted, it was found practicable to obtain the services of drivers in this country, and the establishment was increased without further demands on England, the best of those who first came out becoming foremen in turn. The men engaged in India were necessarily

Engine drivers supplied from England.

## STATE.

Engine drivers supplied from England.

of an unequal standard. Some have, after probation, shown themselves to be steady good men : others have not turned out well, and have left the service. But there have been no quarrels or disturbances with the inhabitants of any part of the foreign territory through which the line runs, and on the whole this branch of the department has passed through a trying time successfully.

Employment of natives as engine drivers.

594. Natives have to a small extent been employed in shunting and driving engines in yards, and in time may turn out qualified drivers. But with no shops yet built, with new stock, with a traffic staff still new to its work and under training, and under all the conditions of a new and incomplete railway, it has not been possible to take any further steps towards the training of native drivers.

Difficulty in obtaining qualified natives for Traffic Department.

595. The Traffic Department on the other hand consists principally of natives. At the largest stations there are European as well as Native Station Masters, but the number of these is very small. Very great difficulty has, however, been experienced in obtaining qualified natives who are not already in the employment of Guaranteed Railway Companies. Native Station Masters are required to be conversant with telegraphy, and in order to obtain qualified persons, young men have been admitted as probationers to be instructed in a Telegraph School. After obtaining a certificate of proficiency, they have been sent out as Clerks and Asst. Station Masters to stations on the line. Unfortunately the demand for men for new sections of the line has been so great that it has been necessary to take some of the men from school before they had acquired sufficient expertness in telegraphy to obtain the required certificate, but such men are all kept on a minimum of pay, and must obtain their certificate before being permanently appointed to the line. Many of these men have since qualified themselves and obtained certificates of competency.

596. There has been no lack of candidates for employment, but the knowledge of English which most of them possess is very small, and the working of this branch of the service has in consequence required very constant supervision on the part of both the Traffic Superintendent and the Controller of Accounts, who is the Auditor of the Line.

597. The Medical and Police Departments were under organization at the close of the year.

## STATE.

## Returns of Traffic.

598. Under the orders of Government, the Revenue Accounts of State Railways are made up at the end of each half of the calendar year, as is the case with Guaranteed Railways. The prescribed Tables attached to this Report show therefore, as usual, the traffic of the calendar year 1874, as it would be impossible to prepare them accurately for the financial year without closing the books of the Railway.

599. In the early returns of a Railway it is rather for promise of traffic than for traffic itself that search has to be made. But there are some interesting facts regarding this line which deserve mention.

600. Until 7th December 1874, there were four classes of passengers on the Delhi District, but on that day the fares were changed and the numbers of classes reduced to the standard of three in force on the Agra District. The fares per station distance were—

## Passenger Traffic.

## CLASSES.

	1st. As.	2nd. As.	3rd. As.	4th. As.
Delhi District	8	4	2	1
Agra „	8	4	1½	...

601. The one anna fare on the Delhi District was equivalent to a fare of 1.38 pies per mile, and the 1½ anna fare on the Agra District was equivalent to a fare of 1.91 pies per mile between Agra and Jeypur. These equivalents necessarily vary with the proportion between the open mileage and the number of stations on that mileage. So when the whole line is open from Agra and Delhi to Nasirabad, the fare of 1½ anna per station will have a different mileage value, and will be equivalent to 2.0 pies per mile.

602. The low rate on the Delhi District was decidedly successful in attracting traffic. During the 1st half of 1874, when the open line was confined to the section between Delhi and Rewari, 635 passengers were on an average carried daily over each mile of line in one direction or the other. On the Agra District, during the same period, the average number was only 250, and although this district was differently circumstanced as regards trade and the distribution of the population, still there seemed to be much in favor of the low fares. These fares, however, were not sufficient to make the railway pay, and passengers were under them carried at a minimum of profit, if not actually at a loss. It was therefore decided that they should be raised as above mentioned.

603. Any increase of fares is necessarily followed by a reduction in the number of travellers, but this increase took

## STATE.

## Passenger Traffic.

place at a time when the line was simultaneously extended, and the increased facility of travelling soon brought more passengers to the line. At first the total number of passengers fell rapidly, but after a short time it began again to increase, and was still increasing at the close of the financial year. In round figures the average number of passengers travelling daily over each mile of line on the Delhi District from 1st July to 7th December 1874 was 490, and their fares amounted to Rs 3-5-4 per open mile. From the 1st January 1875 to Saturday 27th March 1875, the corresponding figures were 330, and Rs 3-11-6.

604. The average length open in the first case was only 83 miles, and in the second 142 miles, and the best-paying section of 58 miles, between Delhi and Rewari, was common to both, so that the reduction in the number of passengers per mile from the increase of the fare was not really so great as would appear from these figures. The average number of passengers booked per week on the Delhi District was in the first period 9670, and in the second 9230.

605. During the whole year 1874 there were 685,409 passengers booked on the two districts, and the average distance travelled was  $34\frac{1}{2}$  miles.

## Goods Traffic.

606. The most remarkable feature of the goods traffic has been the large quantity of loose cotton brought to most of the stations in Rajputana for conveyance to Agra. Much of it came from Tonk on pack-bullocks to Dosa, where it took the rail. Between November 1874 and 31st March 1875, 135,000 maunds of cotton were brought into Agra by the railway. The shortness of the supply of rolling-stock caused some delay in the carriage of the cotton, and it was attempted to obviate this by erecting screws for light pressure at Jeypur and Dosa, and by reducing the rate for pressed cotton. But the consignors declined to use the screws, alleging that the pressure reduced the market value more than could be compensated by any reduction of rate.

## Salt Traffic.

607. Salt was brought from Farukhnagar to Delhi, from Bhartpur to Agra, and from Dosa and Jeypur towards both Agra and Delhi. The chief point to note is that the traffic from the two former sources of supply was not unfavorably affected by the facility given to Sambhar salt. During the year 1874, 20,575 tons of salt were carried to Delhi from the Farukhnagar works, and 22,930 tons to Agra from Bhartpur. Altogether the railway brought in 54,010 tons of salt to its two terminal stations at Agra and Delhi for distribution in the North West Provinces and Oudh.

## STATE.

608. The total quantities of different kinds of goods brought to the line for carriage during the year 1874 were as follows :—

AGRA DISTRICT.					Tons.
Coal	...	...	...	...	58·8
Cotton	...	...	...	...	1,110·9
Fruits, fresh	...	...	...	...	31·2
„ dry	...	...	...	...	180·6
Furniture	...	...	...	...	34·6
Ghi and oil	...	...	...	...	107·3
Grains	...	...	...	...	3,585·5
Gum	...	...	...	...	29·1
Gunny bags	...	...	...	...	423·5
Hides and leather	...	...	...	...	284·4
Jute and flax	...	...	...	...	14·2
Metals	...	...	...	...	129·1
Oilmans' stores	...	...	...	...	40·4
Piece-goods	...	...	...	...	406·2
Railway material	...	...	...	...	31,004·1
Safflower	...	...	...	...	251·9
Salt	...	...	...	...	30,863·4
Seeds	...	...	...	...	309·5
Spices	...	...	...	...	47·1
Stationery	...	...	...	...	13·4
Stones	...	...	...	...	131·8
Sugar	...	...	...	...	2,863·4
Sulphur	...	...	...	...	17·2
Telegraph stores	...	...	...	...	41·6
Timber	...	...	...	...	143·8
Tobacco	...	...	...	...	21·6
Turmeric	...	...	...	...	39·4
Wines	...	...	...	...	62·6
Wool	...	...	...	...	134·9
Woollen goods	...	...	...	...	23·3
Miscellaneous	...	...	...	...	184·9
TOTAL					72,589·7

DELHI DISTRICT.					Tons.
Cotton	...	...	...	...	174·36
Flour	...	...	...	...	92·58
Fruits and vegetables	...	...	...	...	556·75
Ghi and oil	...	...	...	...	6·3
Grain, edible	...	...	...	...	1,606·61
Gunny	...	...	...	...	329·05
Hides and leather	...	...	...	...	122·3
Metals	...	...	...	...	337·84
Oil-cake	...	...	...	...	5·0
Piece-goods	...	...	...	...	335·01
Railway material	...	...	...	...	5,918·02
Rice	...	...	...	...	4,589·53
Salt	...	...	...	...	23,759·90
Seeds	...	...	...	...	482·37
Sugar	...	...	...	...	3,002·84
Wines	...	...	...	...	7·1
Stone	...	...	...	...	689·8
Wood	...	...	...	...	340·97
Woollen goods	...	...	...	...	10·1
Miscellaneous	...	...	...	...	2,045·15
TOTAL					44,411·58

609. The total goods traffic carried on both districts amounted to 5,111,844 ton miles.

## STATE.

## Earnings and outlay.

610. The expenditure during the period in which a railway is first opened for traffic is affected by so many variable conditions, that it seems best simply to record the facts without comment. The figures of earnings and expenditure for the whole year 1874 are given in the attached table, but the traffic since the beginning of 1875 has increased so largely that the figures of 1874 are no indication of the state of things at the close of the year 1874-75, when the earnings had mounted to Rs. 36,000 a week, or Rs. 111 per open mile.

611. During the year 1874 the railway earned Rs. 6,18,312 from the carriage of 685,409 passengers, and 117,001 tons of goods over districts which made the units of work 24,429,852 passenger miles and 5,111,844 ton miles of goods. The carriage of this traffic cost Rs. 4,96,548, leaving a net profit of Rs. 1,21,764.

612. In the first 13 weeks of 1875 the railway earned Rs. 4,06,125 by the carriage of 210,292 passengers and 45,223 tons of goods. The mileages are not yet worked out with exactness, and the cost of carriage is as above explained only ascertainable half-yearly.

## Rolling-Stock.

613. There was some difficulty in maintaining the rolling-stock in good order, as in the earlier part of the year the supply was limited—owing partly to withdrawals for the Famine Railway in Tirhoot—and the vehicles had to be turned round as fast as possible. The actual numbers of locomotives and vehicles on the line on 31st March 1875 is shown in a table attached to this report.

## Capabilities of Rolling Stock for conveyance of troops.

614. Two Military Committees assembled in the course of the year to enquire into the capabilities of the rolling-stock for the carriage of troops with their equipment and horses. It was found that the vehicles were capable of doing all that could be required in this respect. On an emergency horses would be carried in open high-sided wagons. These wagons have roofs, and will each hold three horses comfortably, besides syces, fodder, harness, &c. No other description of military equipment presents any difficulty in this respect.

## Locomotives used.

615. Five different classes of locomotives have been supplied to the line. One description is of a very powerful kind, and as an experiment, an engine of this class brought into Agra 70 loaded wagons. The train weighed 460 tons, and kept time at 15 miles an hour without difficulty.

## Brakes on vehicles.

616. Experiments were made during the year by which the power of the different kinds of brakes on the engines and vehicles was tested and ascertained.



## STATE.

## Train Service.

617. The train services were, as stock became available, arranged so as to suit the passenger traffic as much as possible. On the Agra District, in the middle of February, a night service in addition to the day service was established between Agra and Jeypur, and it has become very popular. On the Delhi District, a double service is maintained between Rewari and Delhi, but there is not sufficient traffic on the Rewari-Bandikui Section to warrant the extension of the second service, and this part of the line is less well served than the remainder. There has been some want of punctuality in running, in consequence of the limitation of speed, the novelty of their duties to most of the staff, and the various delays incidental to working over a new and unfinished railway. Steps have been taken to ensure punctuality.

## Accidents.

618. The only noteworthy accident in which the lives of passengers were placed in jeopardy occurred on the 19th February 1875. In the early morning a passenger train shortly after leaving Bhartpur ran over a heifer which the cow-catcher of the engine failed to throw aside. The locomotive broke away from the train and steamed ahead. Eleven goods wagons which followed the engine were capsized, one by one, and piled on the roadway, but the passenger carriages, which followed with diminishing velocity, remained on the rails. No persons were hurt or shaken.

619. The cattle found in the neighbourhood of Bhartpur are mostly wild forest kind of very active habits, and frequently stray on the line. There are fences near level-crossings and villages, and in places where the cattle are most prevalent, but it has been decided that this is not sufficient, and a continuous fence is about to be made.

620. At the close of the year 1874-75 arrangements were being made for fitting up cooling apparatus in 1st and 2nd class carriages for use during the hot weather.

Cooling apparatus in  
1st and 2nd class  
carriages.

621. Refreshment rooms were opened during the year at Bandikui junction, and tea and coffee were provided at Bhartpur.

Refreshment rooms.

622. Generally speaking, it may be said that while at the close of the year much remained to be done for the comfort of European passengers, such as the provision of retiring places in 2nd class carriages, reduction of the delays at stations, increase of through speed, completion of the fittings of waiting-rooms, &c., considerable progress had been made towards providing these comforts so far as was consistent with the limited appliances yet available, and with the desires

Comfort of passengers  
provided for.

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**STATE.**

Comfort of passengers  
provided for.

of native passengers. In some ways the wants of the two classes of passengers are different, and cannot be always met except by the expensive alternative of providing trains to suit each class. The natives seem thoroughly to enjoy a journey in which they are not hurried and bustled about at stations and made to take seats in haste under the penalty of being left behind. The inhabitants of a district to which railway travelling is a novelty can hardly be expected to have an energetic European's idea of the value of time ; and while the delays which the time-table provides are undoubtedly wearisome to European passengers, they are convenient to natives ; that is to say, to 99 passengers out of every 100. Where there is considerable through, as well as local, traffic, there is, however, less necessity for delay on the road, and the through traffic gives promise of sufficient increase to warrant a faster service throughout the line before long.

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# APPENDIX A.

[ Imperial. ]

PART I.

APPROPRIATION ACCOUNT OF PUBLIC WORKS, IMPERIAL, FOR THE YEAR 1874-75.

Section A.

SERVICE HEADS.								Grants as per Budget Orders.	Final grants at end of year.	Outlay.
ORIGINAL WORKS.								Rs.	Rs.	Rs.
Military	...	...	...	...	...	...	...	70,000	1,02,600	1,04,131
Civil Buildings	...	...	...	...	...	...	...	20,500	20,500	20,850
Total								90,500	1,23,100	1,24,981
REPAIRS.										
Military	...	...	...	...	...	...	...	66,000	84,000	73,573
Civil Buildings	...	...	...	...	...	...	...	15,500	15,500	11,570
Total								81,500	99,500	85,143
Establishment	...	...	...	...	...	...	...	43,000	47,000	53,245
Tools and Plant	...	...	...	...	...	...	...	...	...	...
Increase to London Stores	...	...	...	...	...	...	...	...	...	...
Net additional grant sanctioned during the year	...	...	...	...	...	...	...	54,600	...	...
Total								2,69,600	2,69,600	2,63,369
Less—Expenditure in England	...	...	...	...	...	...	...	...	...	...
Grant for expenditure in England transferred to other works for expenditure in India	...	...	...	...	...	...	...	...	...	...
Net outlay in India								2,69,600	2,69,600	2,63,369
SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE (AS PER STATEMENT ANNEXED).										
New supplies	...	...	...	...	...	...	...	7,000	7,000	3,321 2,191 551 ...
Repairs	...	...	...	...	...	...	...			
Establishment	...	...	...	...	...	...	...			
Profit and Loss	...	...	...	...	...	...	...			
Total								7,000	7,000	6,063
Less—Expenditure in England	...	...	...	...	...	...	...	...	...	...
Net outlay in India								7,000	7,000	6,063
GRAND TOTAL								2,76,600	2,76,600	2,69,432
Expenditure on Imperial Works from funds supplied in addition to Budget-Grants.									Amount of contribution.	Outlay.
Nil.										

# APPENDIX A.

Imperial.—PART. I—concluded.

APPROPRIATION ACCOUNT OF IMPERIAL FUNDS DURING THE YEAR 1874-75,

ARRANGED BY HEADS OF SERVICE.

Section B.

SERVICE HEADS.								Grants as per Budget Orders.	Final grant at end of year.	Outlay.
MILITARY.								Rs	Rs	Rs
Original Works	...	...	...	...	...	...	...	70,000	1,02,600	1,04,131
Repairs	...	...	...	...	...	...	...	66,000	84,000	73,573
Establishment	...	...	...	...	...	...	...	34,000	38,000	44,426
Tools and Plant	...	...	...	...	...	...	...	...	...	...
Net additional grant sanctioned during the year	...	...	...	...	...	...	...	54,600	...	...
Total								2,24,600	2,24,600	2,22,130
Less—Expenditure in England	...	...	...	...	...	...	...	...	...	...
Grant for expenditure in England transferred to other works for expenditure in India								...	...	...
Net outlay in India								2,24,600	2,24,600	2,22,130
OTHER SERVICES.										
Civil Buildings.										
Original Works	...	...	...	...	...	...	...	20,500	20,500	20,850
Repairs	...	...	...	...	...	...	...	15,500	15,500	11,570
Establishment	...	...	...	...	...	...	...	9,000	9,000	8,819
Increase to London Stores	...	...	...	...	...	...	...	...	...	...
Net additional grant during the year	...	...	...	...	...	...	...	...	...	...
Total								45,000	45,000	41,239
Less—Expenditure in England	...	...	...	...	...	...	...	...	...	...
Net outlay in India								45,000	45,000	41,239
SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE.										
New supplies	...	...	...	...	...	...	...	7,000	7,000	3,321
Repairs	...	...	...	...	...	...	...			2,191
Establishment	...	...	...	...	...	...	...			551
Less—Expenditure in England	...	...	...	...	...	...	...	...	...	...
Net outlay in India								7,000	7,000	...
Total								7,000	7,000	6,063
GRAND TOTAL								2,76,600	2,76,600	2,69,432

# APPENDIX A.

## Imperial.—PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNTS, IMPERIAL, FOR THE YEAR 1874-75.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>		
<b>ORIGINAL WORKS.</b>		
	<b>Rs</b>	
Protective river works at Dera Ismail Khan	6,700	Government of India, Public Works Department, No. 656 A-G dated 9th October 1874.
Metalling Cantonment roads at Jhelum ...	2,240	
Minor Works, Military ... ..	1,060	
Additional grant for Vidor outpost ...	2,600	Govt. of India, P. W. D., No. 45 A dated 5th February 1875.
Protective works at Dera Ismail Khan ...	20,000	Govt. of India's telegram dated 16th March 1875; also Govt. of India, P. W. D., No. 219 dated 24th March 1875.
<b>REPAIRS.</b>		
Additional grant for repairs to the Cattle Farm buildings at Hissar ... ..	15,000	Govt. of India, P. W. D., No. 56 A-M dated 7th October 1874.
Additional grant for Repairs, Military, for 1874-75 ... ..	8,000	Govt. of India, P. W. D., No. 13 A-G dated 18th January 1875.
<b>ESTABLISHMENT.</b>		
Additional grant for 1874-75 ... ..	4,000	Govt. of India, P. W. D., No. 13 A-G dated 18th January 1875.
	54,600	
<b>REDUCTION.</b>		
<b>Nil.</b>	...	
Net addition ... ..	54,600	

D. H. TRAIL, Major, R. E.,  
Controller Public Works Accounts, Punjab.

# APPENDIX B.

[ Provincial. ]

## PART I.

APPROPRIATION ACCOUNT OF PUBLIC WORKS, PROVINCIAL, FOR THE YEAR 1874-75.

### Section A.

SERVICE HEADS.	Grants as per Budget Orders.	Final grants at end of year.	Outlay.
	Rs.	Rs.	Rs.
<b>ORIGINAL WORKS.</b>			
Civil Buildings ... ..	7,88,000	7,02,628	5,78,828
Communications ... ..	...	67,768	34,075
Miscellaneous Public Improvements ... ..	...	80,000	80,000
	7,88,000	8,50,396	6,92,903
<b>REPAIRS.</b>			
Civil Buildings ... ..	1,67,000	1,88,040	1,60,465
Communications ... ..	3,56,000	3,58,100	3,58,100
Miscellaneous Public Improvements ... ..	...	...	...
	5,23,000	5,46,140	5,18,565
Establishment ... ..	2,64,000	3,06,800	3,29,696
Tools and Plant ... ..	25,000	29,000	54,009
Profit and Loss ... ..	...	...	31,816
Additional grant sanctioned during the year ... ..	1,32,336	...	...
Total ... ..	17,32,336	17,32,336	16,26,989
Deduct—Decrease to Stock ... ..	...	...	54,424
Total ... ..	17,32,336	17,32,336	15,72,565
Expenditure on Provincial Works from funds supplied in addition to Budget Grants.		Amount of contribution grant-in-aid.	Outlay.
		Rs.	Rs.
<b>CONTRIBUTIONS.</b>			
<b>ORIGINAL WORKS.</b>			
Civil Buildings ... ..		9,075	9,075
<b>REPAIRS.</b>			
Civil Buildings ... ..		159	159
Grant-in-aid from General Local Funds : (for details See Appropriation and Outlay Account of Public Works General Local Fund) ... ..		14,20,400	12,49,337
Total ... ..		14,29,634	12,58,571

## APPENDIX B.

Provincial.—PART I—concluded.

APPROPRIATION ACCOUNT OF PUBLIC WORKS, PROVINCIAL, FOR THE YEAR 1874-75,  
ARRANGED BY HEADS OF SERVICE.

### Section B.

SERVICE HEADS.	Grants as per Budget Orders.	Final grants at end of year.	Outlay.
	Rs.	Rs.	Rs.
Civil Buildings ... .. { Original Works ...	7,88,000	7,02,628	5,78,828
{ Repairs ... ..	1,67,000	1,88,040	1,60,465
	9,55,000	8,90,668	7,39,293
Communications ... .. { Original Works ...	...	67,768	34,075
{ Repairs ... ..	8,56,000	8,58,100	8,58,100
	8,56,000	4,25,868	3,92,175
Miscellaneous Public Improvements ... { Original Works ...	...	80,000	80,000
{ Repairs ... ..	...	...	...
	...	80,000	80,000
Establishment ... ..	2,64,000	3,06,800	3,29,696
Tools and Plant ... ..	25,000	29,000	54,009
Profit and Loss ... ..	...	...	31,816
Additional grant sanctioned during the year ...	1,82,386	...	...
	17,82,386	17,32,386	16,26,989
Deduct—Decrease to Stock ... ..	...	...	54,424
TOTAL OUTLAY ... ..	17,82,386	17,32,386	15,72,565

## PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL  
APPROPRIATION AND OUTLAY ACCOUNT, PROVINCIAL, FOR THE YEAR 1874-75.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>	<b>Ra.</b>	
Additional grant for Muzaffargarh embankment...	80,000	Punjab Government, Civil Department, No. 1071 dated 26th June 1874, received with Punjab Government, Irrigation Branch, No. 2873 dated 14th July 1874.
Metalling and maintaining Siálkot and Wazirabad Road (restored with effect from the beginning of 1873-74).	41,368	Government of India's No. 4110 dated 30th June 1874, received with Punjab Government No. 722 C dated 20th October 1874.
Additional grant to cover the cost of the two Fortified Police Stations in Pargannah Táńk in the Dera Ismail Khan District.	11,428	Punjab Government, Civil Department, No. 12 dated 4th January 1875, received with Punjab Government No. 506 dated 1st February 1875.
	1,32,796	
<b>REDUCTION.</b>		
Transferred to General Local Funds—Provincial share of the cost of repairs to Vernacular Schools.	460	Punjab Government No. 1639 dated 1st August 1874, and Punjab Government No. 3007 dated 24th August 1874.
NET ADDITION TO BUDGET-GRANT ...	1,32,336	

D. H. TRAIL, Major, R. E.,  
Controller Public Works Accounts, Punjab.

# APPENDIX C.

[ General Local Fund. ]

PART I.

APPROPRIATION ACCOUNT OF PUBLIC WORKS (GENERAL LOCAL FUND) FOR THE  
YEAR 1874-75.

Section A.

SERVICE HEADS.								Grants as per Budget Orders.	Final grants at end of year.	Outlay.
ORIGINAL WORKS.								Rs.	Rs.	Rs.
Civil Buildings	...	...	...	...	...	...	...	1,15,000	30,400	21,366
Communications	...	...	...	...	...	...	...	1,86,000	2,46,389	1,85,954
Miscellaneous Public Improvements	...	...	...	...	...	...	...	22,000	83,267	47,306
								3,23,000	3,60,056	2,54,626
REPAIRS.										
Civil Buildings	...	...	...	...	...	...	...	...	5,060	3,325
Communications	...	...	...	...	...	...	...	2,37,000	2,42,894	1,98,840
Miscellaneous Public Improvements	...	...	...	...	...	...	...	74,000	81,050	80,937
								3,11,000	3,29,004	2,83,102
Additional grant sanctioned during the year								55,060	...	...
Total								6,89,060	6,89,060	5,37,728
GRANT-IN-AID TO PROVINCIAL FUNDS.										
ORIGINAL WORKS.										
Civil Buildings	...	...	...	...	...	...	...	1,28,000	1,84,610	1,07,918
Communications	...	...	...	...	...	...	...	4,65,000	3,86,790	3,20,852
Miscellaneous Public Improvements	...	...	...	...	...	...	...	15,000	14,000	19,911
								6,08,000	5,85,400	4,48,681
REPAIRS.										
Civil Buildings	...	...	...	...	...	...	...	...	...	86
Communications	...	...	...	...	...	...	...	4,80,000	4,84,000	4,47,832
Miscellaneous Public Improvements	...	...	...	...	...	...	...	...	5,000	2,635
								4,80,000	4,79,000	4,50,553
Establishment	...	...	...	...	...	...	...	3,56,000	3,56,000	3,50,103
Tools and Plant	...	...	...	...	...	...	...	...	...	...
Additional grant sanctioned during the year								...	...	...
Total								14,44,000	14,20,400	12,49,337
Less—Reduction in grant (transferred to G. L. Fund proper)								23,600	...	...
TOTAL								14,20,400	14,20,400	12,49,337
TOTAL OUTLAY								21,09,460	21,09,460	17,87,065
Expenditure on General Local Fund Works from funds supplied in addition to Budget-Grant.								Amount of contribution.		Outlay.
ORIGINAL WORKS.								Rs.	Rs.	
Civil Buildings	...	...	...	...	...	...	...	115	115	
Communications	...	...	...	...	...	...	...	26,625	14,187	
Miscellaneous Public Improvements	...	...	...	...	...	...	...	9,486	9,215	
								36,226	23,517	
REPAIRS.										
Communications	...	...	...	...	...	...	...	58	58	
Miscellaneous Public Improvements	...	...	...	...	...	...	...	548	164	
								606	222	
Total								36,832	23,739	



## APPENDIX C.

General Local Fund.—PART I—concluded.

APPROPRIATION ACCOUNT OF GENERAL LOCAL FUND DURING 1874-75, ARRANGED  
BY HEADS OF SERVICE.

### Section B.

SERVICE HEADS.				Grants as per Budget Orders.	Final grants at end of year.	Outlay.
				Rs.	Rs.	Rs.
Civil Buildings	...	...	{ Original Works...	1,15,000	80,400	21,366
			{ Repairs	...	5,060	3,325
Communications	...	...	{ Original Works...	1,86,000	2,46,889	1,85,954
			{ Repairs	2,37,000	2,42,894	1,98,840
Miscellaneous Public Improvements	...	...	{ Original Works...	22,000	83,267	47,306
			{ Repairs	74,000	81,050	80,937
Additional grant sanctioned during the year				55,060	...	...
Total				6,89,060	6,89,060	5,37,728
GRANT-IN-AID TO PROVINCIAL FUNDS.						
Civil Buildings	...	...	{ Original Works...	1,28,000	1,84,610	1,07,918
			{ Repairs	...	...	86
Communications	...	...	{ Original Works...	4,65,000	3,86,790	3,20,852
			{ Repairs	4,80,000	4,84,000	4,47,832
Miscellaneous Public Improvements	...	...	{ Original Works...	15,000	14,000	19,911
			{ Repairs	...	— 5,000	2,635
Establishment	...	...	...	3,56,000	3,56,000	3,50,103
Tools and Plant	...	...	...	...	...	...
Additional grant sanctioned during the year				...	...	...
Less—Reduction in grant (transferred to General Local Fund proper)				14,44,000	14,20,400	12,49,337
				23,600	...	...
TOTAL GRANT-IN-AID				14,20,400	14,20,400	12,49,337
TOTAL GENERAL LOCAL FUND				21,09,460	21,09,460	17,87,065

### PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL  
APPROPRIATION AND OUTLAY ACCOUNTS (GENERAL LOCAL) FOR THE YEAR 1874-75.

PARTICULARS.	Amount.	REFERENCES.
ADDITIONS.		
Additional grant for Vernacular Schools, Jullundur District	Rs. 460	{ Punjab Government, Public Works Department, Nos. 1839 and 2007 dated 1st and 24th August 1874 respectively.
Additional grant for the construction of Muzaffargarh embankment	21,000	{ Punjab Government, Civil Department, No. 171 dated 2nd February 1875.
Additional grant for the construction of regulating bridges on certain canals crossed by the Muzaffargarh embankment	10,000	{ Punjab Government, P. W. D., Irrigation Branch, No. 634 A-I dated 11th February 1875.
		{ Punjab Government, Civil Department, No. 348 dated 10th March 1875.
		{ Punjab Government, P. W. D., Irrgn. Beh., No. 1247 dated 20th March 1875.
		{ Punjab Government, P.W.D., Irrgn. Beh., No. 1825 A-I dated 20th April 1875.
Total	81,460	

*N. B.*—There was a reduction of Rs. 23,600 during the year; but as no detail was given, the amount has not been entered in the body of this statement; Rs. 81,460 is the net addition during the year.

D. H. TRAIL, Major, R. E.,  
Controller Public Works Accounts, Punjab.

# APPENDIX D.

[ Irrigation ]

## PART I.

APPROPRIATION ACCOUNT OF IRRIGATION WORKS IN THE PUNJAB FOR THE YEAR 1873-74.

*Extraordinary and Ordinary.*

SERVICE HEADS.							Grant as per Budget Orders.	Final Grant at end of year.	Outlay.
CAPITAL.							Rs	Rs	Rs
EXTRAORDINARY.									
Works	...	...	...	...	...	..	17,53,040	13,82,040	8,86,661
Establishment	...	...	...	...	...	..	6,32,110	4,67,110	4,50,316
Plant	...	...	...	...	...	..	8,14,850	8,50,850	4,88,023
Suspense Balances	...	...	...	...	...	..	...	...	3,00,777
Total						..	27,00,000	27,00,000	21,25,777
Less Receipts on Capital Account						..	...	...	10,876
Net Outlay						..	27,00,000	27,00,000	21,14,901
Less Expenditure in England						..	1,75,000	1,75,000	...
Net Expenditure in India						..	25,25,000	25,25,000	21,14,901
ORDINARY.									
Works	...	...	...	...	...	..	48,100	1,08,711	78,970
Establishment	...	...	...	...	...	..	56,253	26,653	45,527
Plant	...	...	...	...	...	..	1,000	1,000	3,030
Profit and Loss	...	...	...	...	...	..	...	...	...
Suspense Balances	...	...	...	...	...	..	...	...	— 36,034
Total						..	1,05,353	1,36,364	91,493
Less Receipts on Capital Account						..	...	...	16,495
Net Outlay						..	1,05,353	1,36,364	74,998
Less Expenditure in England						..	...	...	826
Additional Grant						..	31,011	...	...
Net Expenditure in India						..	1,36,364	1,36,364	74,172
TOTAL CAPITAL (IMPERIAL)						..	26,61,364	26,61,364	21,89,073
REVENUE.									
Works	...	...	...	...	...	..	39,320	40,797	18,441
Maintenance and Repairs	...	...	...	...	...	..	4,48,130	4,50,602	4,20,161
Establishment	...	...	...	...	...	..	6,69,897	6,34,937	6,11,802
Tools and Plant	...	...	...	...	...	..	37,300	37,300	28,548
Profit and Loss	...	...	...	...	...	..	...	...	271
Total						..	11,94,647	11,63,636	10,79,223
Less Expenditure in England						..	2,000	2,000	...
Less Reduction in Grant						..	31,011	...	...
Net Expenditure in India						..	11,61,636	11,61,636	10,79,223
TOTAL IMPERIAL						..	38,23,000	38,23,000	32,68,296

# APPENDIX D.

## PART I—concluded.

APPROPRIATION ACCOUNT OF IRRIGATION WORKS IN THE PUNJAB FOR THE YEAR 1874-75.

Ordinary.

SERVICE HEADS.							Grant as per Budget Orders.	Final Grant at end of year.	Outlay.
CONTRIBUTIONS.									
CAPITAL.							Rs	Rs	Rs
Ordinary.									
Works	...	...	...	...	...	..	4,82,050	4,82,050	2,77,087
Establishment	...	...	...	...	...	..	1,74,700	1,74,700	1,48,848
Plant	...	...	...	...	...	..	1,43,250	1,43,250	2,33,301
Suspense Balances	...	...	...	...	...	..	...	...	81,686
Total							8,00,000	8,00,000	7,40,922
Less Receipts on Capital Account							...	...	5,334
Net Outlay							8,00,000	8,00,000	7,35,588
Less Expenditure in England							...	...	...
Net Expenditure in India							8,00,000	8,00,000	7,35,588
REVENUE.									
Works	...	...	...	...	...	..	...	...	165
Maintenance and Repairs	...	...	...	...	...	..	...	13,308	12,791
Establishment	...	...	...	...	...	..	...	...	...
Plant	...	...	...	...	...	..	...	...	...
Profit and Loss	...	...	...	...	...	..	...	...	...
Additional Grant	...	...	...	...	...	..	13,308	...	...
Total							13,308	13,308	12,956
Less Expenditure in England							...	...	...
Net Expenditure in India							13,308	13,308	12,956
TOTAL CONTRIBUTIONS							8,13,308	8,13,308	7,48,544
GRAND TOTAL							46,36,308	46,36,308	40,16,840

D. H. TRAIL, Major, R. E.,  
Controller Public Works Accounts, Punjab.

# APPENDIX E.

STATEMENT SHOWING THE PROGRESS MADE IN CONSTRUCTION OF GUARANTEED RAILWAYS IN THE PUNJAB, AND THE STATE OF THEIR WORKING FROM  
1st APRIL 1874 TO 31st MARCH 1875.

Name of Railway.	Mileage open during the year.	Total mileage open.	PASSENGERS DURING THE YEAR.					Receipts from passengers.	Receipts from merchandise and miscellaneous.	Total receipts.	Working expenses.	Net profits.	No. of European and Eurasian Staff.	No. of Native Staff.	Total Capital expended from commencement.	
			Total.													
			1st Class.	2nd Class.	Intermediate Class.	3rd Class.										
<i>Scinde, Punjab and Delhi Railway.</i>																
Punjab and Delhi Line ...	...	566	14,659	30,171	19,732	2,052,882	2,117,444	18,72,219	32,94,739	51,66,958	29,17,666	22,49,292	388	7,966	6,52,09,115	
Scinde Line ...	...	110	1,616	3,508	...	74,691	79,815	1,07,745	7,39,808	8,47,553	6,87,731	1,59,822	197	1,955	{ 1,99,97,921 46,99,381	
Indus Steam Flotilla (about) ...	...	575	246	185	...	8,661	9,092	59,527	7,29,145	7,88,672	7,92,083	-3,411				
Total ...	...	1,251	16,521	33,864	19,732	2,136,234	2,206,351	20,39,491	47,63,692	68,03,183	43,97,480	24,05,703	585	9,921	8,99,06,417	

# APPENDIX F.

## STATEMENT OF TRAFFIC OF THE RAJPUTANA STATE RAILWAY (OPEN LINE) FOR THE YEAR 1874.

Railway.	Mean open mileage.	PASSENGERS.					RECEIPTS FROM							Working expenses.	Net profits.	European and East Indian Staff.	Native Staff.	Capital expended up to 3rd Decr. 1874.
		1st Class.	2nd Class.	3rd Class.	4th Class.	Total.	Passengers.	Luggage, parcels, &c.	Merchan- dise and live stock.	Railway materials	Minerals.	Miscella- neous.	Total.					
Rajputana State Railway.	171.01 miles.	No.	No.	No.	No.	No.	Re	Re	Re	Re	Re	Re	Re	Re	Re	No.	No.	Rs
		1,995	4,264	235,616	443,534	685,409	2,16,425	12,051	2,98,376	39,798	79	51,583	6,18,312	4,96,548	1,21,764	125	2,137	1,850,548

## MILEAGE RESULTS FOR THE YEAR 1874.

	DETAILS.					AMOUNT.	REMARKS.
	TRAIN MILEAGE	...	...	...	...		
GROSS EARNINGS PER TRAIN MILE	...	...	...	...	...	219,971	
EXPENSES	"	"	"	"	"	2.81	
PROFITS	"	"	"	"	"	2.26	
PER-CENTAGE OF EXPENSES ON EARNING	"	"	"	"	"	.55	
						80.3	

KELLOW C. PYE,  
Manager Rajputana State Railway.

APPENDIX G.

LOCOMOTIVE AND ROLLING-STOCK IN USE ON THE RAJPUTANA STATE RAILWAY  
ON 31ST MARCH 1875.

LOCOMOTIVES.*						VEHICLES.														
A	B 1	B 2	C	D	E	COACHING.						GOODS.								
						1st Class.	1st and 2nd Class.	2nd Class.	3rd Class.	Saloon Carriages.	Brake Vans.	Covered.	High-sided.	Low-sided wood under-frame.	Low-sided iron under-frame.	Low-sided.	Horse Boxes.	Carriage Trucks.	Timber Trucks.	Powder Vans.
12	12	10	10	3	9	12	6	8	83	2	27	441	59	59	30	111	3	3	6	2

\* A Tank Engines, 4 coupled, Dubbs & Co.  
B 1 Bogie " 4 " "  
B 2 " " 4 " Naamyth & Co.  
C " " 6 " "  
D Tender " 4 " Sharp, Stewart & Co.  
E " " 4 " " " with trailing wheels.

KELLOW C. PYE,  
Manager Rajputana State Railway.

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ANNUAL

# PROGRESS REPORT

OF

## PUBLIC WORKS IN PUNJAB,

FOR THE YEAR

1875-76.



LAHORE:

PUBLIC WORKS DEPARTMENT PRESS.

1876.





ANNUAL  
PROGRESS REPORT  
OF  
PUBLIC WORKS IN PUNJAB,  
FOR THE YEAR  
1875-76.



LAHORE:  
PUBLIC WORKS DEPARTMENT PRESS.  
1876.



## Note to accompany Annual Progress Report of Public Works in Punjab, 1875-76.

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This Report contains an account of Imperial, Provincial and Local Works under the Punjab Government executed during the official year 1875-76, together with a separate Report on Canal Works in Punjab by Officers of the Irrigation Branch. It embraces also the Railway Report furnished by the Consulting Engineer for Guaranteed Railways, Lahore, and for the last time the Reports prepared by the Engineer-in-Chief of the Punjab Northern and Indus Vally State Railways, and the Manager of the Rajputana State Railway. The Annual Reports of the State Railways will, in future, under orders contained in Government of India, Public Works Department, Resolution Nos. 2672—80 R dated 7th October 1876, be submitted by the Engineer-in-Chiefs direct to the Director of State Railways, by whom they will be embodied in a general report on State Railways for the year.

2. The Imperial Works which, after the formation of a separate Military Works Branch under the direct orders of the Government of India, remain under the direction of the Punjab Government include the Military buildings, &c., at Hissár, Jhelum and Talagang, and the various Cantonments and Outposts of the Punjab Frontier Force, and buildings for the Post Office and Telegraph Departments. The several roads between the Cantonment of Pesháwar and the Outposts in that District, and the road to the Military Station of Cherát, continued under charge of the Provincial Government, and were maintained from Provincial Funds up to the year under review. These have since been transferred to the charge of the Military Works Branch, a deduction being made by the Government of India from the Provincial assignment on their account.

3. Works the cost of which is met from Provincial Services or the General Local Fund are under the direct management of the Provincial Public Works Officers, except in occasional and less important cases where they are entrusted to Civil Officers, owing to a paucity of local Public Works agency, or for other special reasons. Local works executed from District and Municipal Funds are under the management of the District and Municipal Committees, subject to the general supervision of the Department. The more important Municipal and District Works are entrusted to the Public Works Officers with the sanction of Government. The duty of examining all projects for District Works costing over Rs. 1,200 each also devolves upon Public Works Officers, and their services are occasionally lent to District Committees for the preparation of plans and estimates for works of magnitude or of engineering difficulty. The Provincial Public Works Officers are further expected to attend, whenever practicable, the meetings of District Committees, helping them with professional advice, and inspecting all works executed by them.

4. In connection with the Military Works executed during the year under review by Provincial Public Works agency, it may be noticed that the scheme for supplying potable water to the Kohát Cantonment has been satisfactorily completed. Rifle-ranges have now been provided at all the stations of the Punjab Frontier Force, except at Edwardes-abad, where a new set of ranges was in progress.

5. The continued and serious encroachments of the River Indus at Dera Ismail Khan rendered necessary a heavy outlay on protective works for the safety of the Cantonment. These operations have had to be continued in the following year, and with great success, the main channel of the river being further from the Cantonment now than it ever has been before.

6. The Artesian boring operations at Sabzalkot, in the Deraját, have been much impeded by the nature of the strata met with, and the need occasioned thereby for additional apparatus. It is proposed to continue the borings at other localities on the Deraját Frontier as means and opportunities permit.

7. The only Imperial Civil Work of any special interest in progress this year was the granite obelisk over the remains of the late Dr. Stoliczka at Leh in Ladakh. The material for the obelisk was obtained locally, but the masons and workmen had to be taken from the Punjab. Work was suspended in September owing to the inclemency of the weather.

8. The hot season of 1875 was distinguished by unprecedentedly heavy rains and floods extending from Gurdáspur and Siálkot on the one hand to Delhi and Hissár, and in all that part of the Punjab, causing serious and extensive damage to buildings and roads, and occasioning the Provincial Government much embarrassment by the strain thus put on Provincial Funds ; all necessary repairs were, however, promptly executed, and, as far as possible, damaged buildings rendered secure or reconstructed.

9. Of buildings appertaining to the Department of *Land Revenue*, there were new Tahsils in progress or completed at Talagang, Fatahjang, Pindigheb and Kahúta, in the Ráwalpindi District, and at Abbott-abad, in Hazára. A pressing want has also been supplied by the completion of the new Kacheri for the Deputy Commissioner and Subordinate Civil Officials of various Departments at Amritsar. The auxiliary buildings have, however, still to be provided.

10. For the *Jail* Department solitary cells were constructed at Rohtak, Jhang and Mooltan. The paper-manufactory buildings in the Jails at Rohtak, Siálkot, Dera Ismail Khan and Pesháwar were in process of enlargement and improvement in other respects. The manufactory of paper is an industry of much importance, and specially adapted to the large majority of the prisoners incarcerated in the Provincial Jails, as it can be carried on with but little skilled labor. Two Jail works of magnitude were brought to a termination this year, viz., the conversion of the Gola Sarai at Lahore into a District Jail, and the new Female Penitentiary at Lahore. The effects of the extraordinary rain-fall and floods of the season upon the new Jail buildings in progress at Amritsar were such as almost to destroy them, adding considerably to the heavy demands on the Provincial Government brought about by the floods which prevailed over so large a portion

of the Province. The experience thus dearly gained has been turned to account in the re-selection of a site and of the course to be followed in the reconstruction of the Amritsar Jail.

11. New first class Police Stations were completed or in progress at Hodal and Shahjahánpur, in the Gurgáon District ; at Karnál, Kasauli and Anandpur, in the Hoshiárpur District ; Hamírpur and Pálampur, in the Kángra District ; at Dalhousie, Talagang and Murree, in the Ráwalpindi District ; and at Miánwáli, in the Bannu District. Police hospitals and outposts were also provided at several stations and localities out in the Districts.

12. At the Lawrence Asylum at Sanáwar, new mule-sheds were provided. And at Lahore, the new College was considerably advanced. District Committees provided for the construction of village schools in the Hoshiárpur, Gurdáspur Siálkot and Lahore Districts.

13. A noticeable and satisfactory feature in the Public Works operations of District Committees during the year was the provision in many districts of commodious and suitable dispensary buildings for the relief of the suffering sick. The Committees generally have given much attention to the provision of these useful and necessary buildings.

14. The reroofing and restoration of the "Montgomery Hall" at Lahore was brought to a satisfactory termination, and the building, which was originally constructed through other than Public Works agency, rendered safe and secure.

15. The length in miles of roads in the Punjab, in 1875-76, metalled and unmetalled, other than District roads, which are constructed and maintained from District Funds, was as follows :—

	No. of miles.
Length of the Grand Trunk Road from Delhi to Pesháwar	... 585
Other metalled roads	... 489
Partially metalled roads	... 135
Unmetalled roads	... 2,117
Total	... 3,326

16. The above roads are maintained out of Provincial Services and the General Local Fund.

17. The new works under the head of "Communications" in hand during the year were—

The metalling of parts of the Delhi and Mathra road.

Ditto ditto ditto Sirsa road.

A preliminary survey for diversion of the Umballa and Kalka road near the Gaggar river.

A survey of a new line of road from Umballa to Náhan.

The construction of a metalled road from the boundary of the Kapurthala State to the Kartárpur Station, on the Sindh, Punjab and Delhi Railway.

The metalling of the road from Wazirabad to Siálkot.

The consolidation of a second coat of metal on the Grand Trunk Road from Attock to Pesháwar.

The completion of the Kángra Valley Road as a fair weather cart-road extending from Pathámkot to Pálapur.

The improvement of the road over the Lácha-Lang between Kángra and Ladakh, the funds for which were contributed by His Highness the Mahárájah of Kashmir.

The improvement of the road through the "Thal" from Chíchawatni through Jhang on to Dera Ismail Khan.

The widening and improvement of the portion of the Kohát and Pesháwar road crossing the Mír Kalán Pass, making the road passable for laden camels.

Rebuilding a bridge on the 5th mile of the Delhi and Mathra road.

Wing-walls for the protection of the West Beyn bridge on the Grand Trunk Road between Ludhiána and Amritsar.

Several major bridges on the Kángra Valley cart-road.

A masonry bridge in the Gurdáspur District on the road to Amritsar.

Two other masonry bridges on road from Gurdáspur to Siálkot, and on road from Siálkot to Amritsar.

Sarais for the accommodation of travellers in the Rohtak, Gurdáspur, Siálkot, Dera Ismail Khan, Bannu, Hazára and Pesháwar Districts, and three dák bungalows in the Dera Ismail Khan District.

18. The District Committees in the Delhi, Gurgáon, Umballa, Ludhiána, Jullundur, Gurdáspur, Siálkot, Mooltan, Muzaffargarh and Hazára Districts made noticeable progress with the improvement and metalling of numerous lines of District roads and Railway feeders, which cannot fail to be of great convenience to the population generally and of benefit to trade.

19. In the Umballa, Ludhiána and Jullundur Districts particularly the progress made was very satisfactory.

20. The following is a list of the boat-bridges maintained in the Punjab :—

1. Over the River Jumna at Rájghát.
2. " " Sutlej at Phillour.
3. " " " at Ferozepore.
4. " " Beas at Dera Gopípur (Kángra District).
5. " " Rávi at Shahdara (near Lahore).
6. " " " at Kakkar (Amritsar District).
7. " " " at Chíchawatni.
8. " " Chenab at Kádirabad (Gujránwála District).
9. " " " at Wazirabad (Gujrát District).
10. " " " at Trimmu Ghát (Jhang District).
11. " " Jhelum at Jhelum.
12. " " " at Pind Dádan Khan.
13. " " Indus at Dera Ismail Khan.
14. " " " at Attock.
15. " " Kabul at Daudzai (Pesháwar District).
16. " " " at Naushahra ditto.

Of these, the bridges at Shahdara, Chíchawatni and Daudzai are maintained throughout the year. The rest remain dismantled during the monsoon season, and ferry boats are substituted, till at the end of the rains the bridges themselves are reconstructed and reopened for traffic. At Dera Ismail Khan the steamer "Chenab," which formerly belonged to the old Punjab Government Steam Flotilla, plied as a ferry during the flood season.

21. The expenditure during the year on these boat-bridges, and the income derived from them, are shown in the subjoined table :—

Name of Boat-bridge.	Net income after deduction of cost of collection.	Outlay on new works and maintenance.	Surplus of the year.	Deficit of the year.	REMARKS.
	Rs.	Rs.	Rs.	Rs.	
1. Rajghat boat-bridge ... ..	2,042	...	2,042	...	
2. Phillour do. ... ..	8,663	8,161	502	...	
3. Ferozepore boat-bridge... ..	23,633	19,868	3,765	...	
4. Dera Gopipur boat-bridge ... ..	4,774	1,182	3,592	...	
5. Shahdara boat-bridge... ..	22,240	20,241 (a)	1,999	...	(a). Of which Rs. 5,875 on "New Works."
6. Kakkar boat-bridge ... ..	2,422	1,159	1,263	...	
7. Chichawatni boat-bridge ... ..	1,665	1,405	260	...	
8. Kadirabad boat-bridge... ..	6,131	6,043	88	...	
9. Wasirabad do. ... ..	31,600	20,321 (b)	11,279	...	(b). Of which Rs. 2,224 on "New Works."
10. Trimmu Ghat do. ... ..	10,282	13,559 (c)	...	3,277	(c). Of which Rs. 3,026 on "New Works."
11. Jhelum boat-bridge ... ..	22,996	18,948 (d)	4,048	...	(d). Of which Rs. 3,878 on "New Works."
12. Pind Dadan Khan boat-bridge	36,589	12,397	24,192	...	
13. Dera Ismail Khan do. ... ..	16,980	10,682	6,348	...	
14. Attock boat-bridge ... ..	25,026	13,777 (e)	11,249	...	(e). Of which Rs. 5,597 on "New Works."
15. Daudsai do. ... ..	3,864	6,889 (f)	...	3,025	(f). Of which Rs. 4,661 on "New Works."
16. Naushahra boat-bridge... ..	10,232	2,877	7,355	...	
Total ... ..	2,29,139	1,57,459	77,988	6,802	Net surplus, Rs. 71,680.

22. A variety of useful works of public improvement and utility were undertaken in many of the towns in the Province. And the Municipalities generally appear to have had their attention directed towards measures for the improvement of streets, projects for conservancy, construction of tanks and bathing ghats, aqueducts for the supply of potable water, and other works for the comfort and health of the people. A commencement was made with the project for a suitable and sufficient water-supply for the city of Delhi. The surveys for the sewerage and water-supply of the Lahore city were completed. Several canals of great usefulness were opened out in the Ferozepore District. At Jhelum a masonry embankment along the river-bank for the protection of the town and station was in hand. And at Peshawar the improvement of the city drainage, and conservancy of the town generally, occupied the attention and resources of the local Civil Officers and the Municipality.

23. It is a matter for satisfaction that the river-works in the Ravi at Dera Nanak, in the Gurdaspur District, for the protection of the town and of the shrine of Baba Nanak, were attended with complete success.

24. The Palace in the Lahore Fort, the tomb of the Maharajah Ranjit Singh, that of the Emperor Jahangir at Shahdara, and the buildings, &c., of the Shalimar Gardens near Lahore, were much restored, and were visited by the Prince of Wales during His Royal Highness' stay at Lahore.

25. Explorations for Buddhist remains were in progress at Takkal, in the Peshawar District, but no remains of any special importance or interest were discovered.

26. The number of major works, *i. e.*, of works costing over Rs 2,500 each, completed under the agency of Public Works Officers in 1875-76, was 67, of which—

Military	...	...	...	...	13
Civil Buildings	...	...	...	...	33
Communications	...	...	...	...	17
Miscellaneous Public Improvements	...	...	...	...	4
Total	...	...	...	...	67

For these 67 works, *revised* estimates were submitted and sanctioned in 21 cases in 3 of which the revised estimates were of smaller amount than the original sanctioned ones. In only two instances did the actual outlay exceed the sanctioned estimate by more than Rs 500, and the excess in each of these two cases was Rs 562. In 49 instances the actual outlay fell within the sanctioned estimates. The *total outlay* on the 67 works completed, as compared with the *total sanction*, was as follows :—

	Rs
Aggregate amount of the original sanctioned estimates	... 7,57,410
Ditto do. sanctioned estimates as revised in some instances	... 8,23,749
Aggregate actual outlay on the works	... 8,10,478

indicating a fairly close correspondence between the estimated and the actual cost.

27. The following figures show the distribution of the outlay on Imperial, Provincial and General Local Works during 1875-76, under the principal Budget Heads of Service, as compared with the final Budget-grants in each case :—

				Final Budget Grant.	Outlay.
				Rs	Rs
<b>IMPERIAL.</b>					
Military—Works	..	..	..	1,38,700	1,85,464
Repairs	..	..	..	72,300	60,184
Civil Works—Works	..	..	..	1,11,000	93,172
(Post Offices, Telegraph and Government of India's Buildings at Simla). Repairs	..	..	..	13,000	14,964
Total Imperial	..			3,35,000	3,53,784
<b>PROVINCIAL.</b>					
Civil Buildings—Works	..	..	..	3,95,000	3,20,943
Repairs	..	..	..	2,17,907	2,01,117
Communications—Works	..	..	..	1,75,700	1,70,454
Repairs	..	..	..	7,92,900	7,90,868
Mis. Pub. Impts.—Works	..	..	..	1,100	3,256
Repairs	..	..	..	10,593	6,527
Total Provincial	..			15,93,200	14,93,165
<b>GENERAL LOCAL.</b>					
Civil Buildings—Works	..	..	..	79,200	71,839
Repairs	..	..	..	5,430	5,353
Communications—Works	..	..	..	1,33,395	1,12,409
Repairs	..	..	..	2,55,935	2,43,699
Mis. Pub. Impts.—Works	..	..	..	81,210	76,431
Repairs	..	..	..	78,140	78,292
Total General Local	..			6,33,310	5,88,023

ALEX. TAYLOR, MAJOR-GENERAL,

Offg. Secretary to Government Punjab,  
Public Works Department.

Dated 18th December 1876.



# PROGRESS REPORT

OF

## PUBLIC WORKS IN PUNJAB,

FOR THE YEAR 1875-76.

### PART I.—IMPERIAL

#### Military.

#### MILITARY.

The special repairs of the Cattle Farm buildings at *Hissár* were in progress, and the Budget provision of the year for the work was fully utilised. *Hissár.*

2. A "cholera camp" having been established for the troops at *Kasauli*, it was found that to reach it a portion of the road leading to *Simla*, *Sanáwar*, and the adjacent Military stations, had to be traversed. To avoid the danger of infection thus occasioned, a new road was constructed from *Kasauli* to the camp. *Kasauli.*

3. Quarters were constructed for three Native Doctors, and out-offices for servants, attached to the Native Infantry hospital at *Jhelum*. The metalling of the Cantonment roads was also completed. A building formerly used as a traction engine shed was taken over from the Military Works Branch at a valuation, and adapted for use as a rest-house for European troops. *Jhelum.*

4. Progress was made with the construction of stables for the gun-mules of the Mountain Battery at *Abbottabad*. A double Rifle-range also was provided for the two Native Infantry Regiments at this station. *Hazára.*

5. The extension of the water-supply at *Kohát* was brought to completion. The tank in the Left Native Infantry Lines was remodelled, and a portion of the supply-duct replaced in all doubtful ground by earthenware 5½" sanitary pipes embedded in concrete. The tanks being roofed with *Sindh* tiles keep the water cool; and no interruption has occurred in the supply, crossing by syphon, to the Cavalry Lines. *Kohát.*

6. The Rifle-ranges for troops at *Kohát* have been reconstructed. Four ranges in all have been provided, the butts being excavated in the hill slope. Two watch-towers were also built near the ranges. A quarter-guard with two *Kohát.*

## MILITARY.

Kohát.

cells and a store-room was constructed in the Left Native Infantry Lines at *Kohát*. And a small hospital completed for patients of the Artillery. Doors were provided to the barracks in the Left Native Infantry Lines at *Kohát*—an addition strongly recommended by the local Military authorities. The quarters in the Forts at *Kohát*, *Mahomedzai*, *Garnett*, *Latammar*, *Kurruum* and *Jáni Khel*, were also provided with doors where necessary.

Edwardes-abad.

7. The original scheme for Rifle-ranges at *Edwardes-abad* had to be recast on account of the greater lengths insisted upon for the ranges, and provision having to be made for a range for the Cavalry. The question of the site and the land required was under discussion in the Military Department, and towards the close of the official year the arrangements were completed, the land secured, and work on the ranges commenced.

8. The improvement of the Infantry barracks in *Fort Dalkpgarh* was brought to completion. The drainage of the Fort and of the surrounding ditch was also much improved.

9. A patrol-shed and a quarter-guard for Native Cavalry were constructed at *Edwardes-abad*.

Dera Gházi Khan.

10. The reroofing of the buildings in the Right Native Infantry Lines at *Dera Gházi Khan* was completed, excepting only the roof-covering and white-washing of one double-barrack and block of Native Officers' quarters.

Vidour Outpost.

11. Progress was made with the renewal and alterations necessary to the outpost at *Vidour*. The barracks were reroofed, guard-room finished, and the parapet of the back wall of the outpost completed.

Drigri Outpost.

12. The work of reroofing the barrack in the outpost at *Drigri* was also in hand.

Dera Ismail Khan.

13. The action of the River Indus at *Dera Ismail Khan* continued to give grounds for apprehension as to the safety of the Cantonment, and vigorous measures and a considerable outlay were necessary to put a check upon its encroachments. The works commenced in the previous year were pushed on and repaired until the floods. Further protective works were commenced in November 1875; the steamer "Chenab" was put into requisition for the conveyance of materials, &c., and necessary spurs of trees and fascines constructed. The success which attended the operations was very mainly due to the energy and vigilance of the Executive Engineer, Major Thorold, R. E., and his Assistants, whose super-

## MILITARY.

vision of the works in hand and watch over the action of the river were unceasing. Dera Ismail Khan.

14. Doors and windows were provided to several of the blocks of quarters in the Right Native Infantry Lines at *Dera Ismail Khan*.

15. The tank containing the supply of water for the Outpost at Girni in the *Dera Ismail Khan* District not being water-tight, a foundation of concrete was sanctioned for the main tank, and at the close of the year the flooring was in progress.

16. The boring operations in the bottom of the old well at *Sabzalkot* Outpost had to be suspended; the 7" tubes in use having been arrested by a stratum of boulders and pebbles overlying stiff clay could not be forced down with two of Haley's patent jacks of 6 tons each. It is apprehended that it may be requisite eventually to employ tubes of a lesser diameter, 5" and 3", but endeavour is being made to continue the boring with the means already available. Derajat.

## Civil Buildings.

## POST OFFICES.

17. The old thatched Post Office at *Kalka* having been burned down by accident, a new third class Post Office was put in hand, and the foundations completed. Kalka.

18. A new and commodious Post Office building was constructed at *Dera Gházi Khan*. Dera Gházi Khan.

## TELEGRAPHS.

19. A project was prepared and sanctioned for a new Telegraph Office at *Umballa*; but the question of a site being unsettled, work was not commenced. Umballa.

## GENERAL.

20. Materials were collected and work commenced on a granite obelisk over the remains of the late Dr. Stoliczka at Leh in *Ladakh*. Ladakh.

## PART II.—PROVINCIAL.

## Civil Buildings.

## LAND REVENUE.

## BUILDINGS.

- Hissár.** 21. Considerable additions and alterations were effected to the Commissioner's court-house at *Hissár*.
- Hoshiárpur.** 22. The enlargement and alteration of the record-rooms in the Deputy Commissioner's court-house at *Hoshiárpur* were completed. The record-racks were reduced in size, and two additional rooms provided.
- Amritsar.** 23. The new court-house for the Deputy Commissioner at *Amritsar*, containing also accommodation for the Treasury and various Offices, and for the Police, was nearly completed. The Tahsil building at *Amritsar* having sustained much damage from heavy rain and floods, was put into thorough repair, and a new roof provided to it.
- Siálkot.** 24. Materials were collected and work commenced on additions and alterations to the Deputy Commissioner's court-house at *Siálkot*.
- Gujránwála.** 25. A treasury-room on the standard plan was constructed in the Tahsil at *Wazirabad*.
- Dera Gházi Khan.** 26. The enlargement of the court-house for Deputy Commissioner at *Dera Gházi Khan*, commenced in the previous year, was finished.
- Jhelum.** 27. A house at *Dilaur* was purchased and put in proper repair for use by the Settlement Department.
- Ráwalpindi.** 28. Good progress was made with the construction of a Tahsil at *Talagang*. At the recommendation of the Superintending Engineer, concrete was substituted for the rubble masonry originally specified, except for pillars and arches, and has answered satisfactorily. A Tahsil at *Fátahjang*, in which rubble masonry was more extensively employed, was also in progress, and was nearly completed by the end of the official year. The new Tahsil building at *Pindigheb* was finished, and materials collected for a Tahsil at *Kahwáta*.
- Hazára.** 29. At *Abbott-abad* materials were collected for a new Tahsil, and some progress made with the construction of the building.
- Bannu.** 30. Floods in the Indus having washed away the little station of *Miánwáli*, in the *Bannu* District, a new site on higher ground, and further away from the river, was selected for the station, and a new court-house for the Assistant Commissioner built on it.

## BUILDINGS.

## JAILS.

31. The construction of ten solitary cells in the Jail at *Rohtak* was in progress, and the work completed all but the roofing. The paper-manufactory in the jail was also enlarged. Rohtak District.
32. The work-shed in progress in the Jail at *Dharmśāla* was completed, and the work of reroofing the sleeping barracks in the jail was in hand at the close of the year. Kāngra District.
33. Most unusual and disastrous floods and heavy rains almost completely destroyed the new jail buildings in progress at *Amritsar*. The works were suspended, and arrangements put in train for their recommencement on another site. Amritsar District.
34. The paper-manufactory in the Jail at *Siālkot* was enlarged to complete the requirements of that branch of the jail industry. Siālkot District.
35. The conversion of the "Gola Sarai" at *Lahore* into a District Jail was completed, and the buildings partly occupied. The jail contains accommodation for 585 prisoners, with an hospital for 40 patients. Besides the requisite number of sleeping wards, there are solitary cells for 96 prisoners, quarantine cells for 54 prisoners, and wards for 20 prisoners under trial, and for 15 debtors. Also the necessary quarters for the subordinate establishment. Lahore District.
36. The new Female Penitentiary at *Lahore* was also finished and made over for occupation. This building contains accommodation for 268 native prisoners, there being barracks for 200, cells for 48, quarantine cells for 12, and wards for 8 juveniles. There are besides cells for 4 European prisoners, and an hospital for 24 patients, with the necessary workshops, offices and godowns, and quarters for the matron and other subordinate establishment.
37. At the *Lahore* Central Jail, quarters with out-offices were constructed for 2 European warders ; and a house and out-houses for accommodation of the Manager of the Central Jail Press. A verandah, 14 feet wide, was provided on three sides of the Press buildings, and these buildings and the paper-manufactory were separated from each other and from the rest of the jail buildings by enclosure-walls.
38. Sixteen new solitary cells were constructed in the Jail at *Jhang*. Jhang District.

## BUILDINGS.

- Mooltan District. 39. Ten solitary cells were added to the Jail at *Mooltan*. Thirty more of these cells are required, but funds for them were not available.
- Dera Gházi Khan. 40. The new lock-up near Deputy Commissioner's Court at *Dera Ghazi Khan* was completed.
- Dera Ismail Khan. 41. At *Dera Ismail Khan*, the work of doubling the paper-manufactory in the jail was in progress.
- Hazára District. 42. A lock-up was completed at Hattar, in the *Hazára* District.
- Pesháwar District. 43. An enlargement of the paper-manufactory in the *Pesháwar* Jail was in progress, and the work nearly finished by the close of the year. A civil ward for 12 prisoners in this jail was constructed, and a new well provided.

## POLICE.

- Delhi District. 44. A Police Station at the "Sabzi Mandi" near the city of *Delhi* was put in hand by the Municipality, and was nearly finished by the close of the year.
- Gurgáon District. 45. The first class Police Station at Hodal, in *Gurgáon* District, commenced in the previous year, was completed.
46. The building, an old Fort, in which the Police at Shahjahánpur, in the *Gurgáon* District, had hitherto been accommodated, being past repair, a new Police Station on the standard plan was commenced, and good progress made.
- Karnál District. 47. A first class Police Station at *Karnál* was also finished.
- Rohtak District. 48. A Police hospital at the head-quarters of the *Rohtak* District was completed.
- Simla District. 49. The construction of a first class Police Station at *Kasauli* was in hand. Work was suspended for some months on account of an outbreak of cholera in the locality ; but, on the cessation of the epidemic, work was vigorously resumed, and the building about half finished.
- Ludhiána District. 50. Quarters for the Deputy Inspector of Police were built near the Kotwáli at *Ludhiana*.
- Hoshiárpur District. 51. A new Police Station at Anandpur, in the *Hoshiárpur* District, was completed on the standard plan.
- Kángra District. 52. In the *Kángra* District, two first class Police Stations on the standard plan, one at *Hamírpur* and one at *Pálpur*, were completed and made over for occupation.

## BUILDINGS.

53. The new first class Police Station at *Dalhousie* was completed and occupied during the year by the Police. *Gurdaspur District.*

54. The old Police lines at *Gurdaspur*, constructed many years ago, were so damaged by the unprecedentedly heavy rains and floods of this year, that it was found necessary to provide an entirely new set of lines. These comprise two double and one single blocks of barracks on the standard plan, quarters for two Inspectors and Deputy Inspectors, and quarter-guard, &c. The two double blocks of barracks were completed up to top of plinth.

55. Buildings were constructed for the Police at *Pasrúr*, *Siálkot District.*  
in the *Siálkot* District.

56. Second class Police Outposts on the standard plan were constructed at *Dera Dandu Rám*,\* *Vaniaki* and *Jalálpur*, in the *Gujránwála* District. *Gujránwála District.*

57. A first class Police Station was completed at *Talagang*, in the *Ráwalpindi* District, in which concrete work was largely used for the walls. Progress was also made with the new Police Station at *Murree*, in lieu of the former one destroyed by the fire in 1875. In the *Rawalpindi* city, a handsome Municipal Police Station was constructed from Municipal Funds. *Ráwalpindi District.*

58. A Pacea masonry facing was provided to the Police Station at *Hangu* in the *Kohat* District. *Kohát District.*

59. At *Miánwáli*, in the *Bannu* District, a first class Police Station on the standard plan was completed. *Bannu District.*

## EDUCATIONAL.

60. The original mule-sheds at the *Lawrence Asylum*, *Sanawar*, being very old, and entirely beyond repair, a new set of mule-sheds on a suitable plan was constructed. At the close of the year the pointing of the masonry only remained to be done. *Simla District.*

61. Little progress was made with the building for the High School at *Ludhiána*, owing to the difficulty experienced in procuring suitable beams for the timbering, and to further discussions on the part of the authorities concerned in regard to the design. *Ludhiána District.*

62. New buildings for village schools were constructed from District Funds at 11 localities in the *Hoshiárpur* District. *Hoshiárpur District.*

## BUILDINGS.

## Gurdáspur District.

63. The enlargement of the Srígovindpur school, in the *Gurdáspur* District, was in progress from District Funds, and the work about half finished. Another work from District Funds, the rebuilding of the boarding house for *Gurdáspur* school, was in hand, and the masonry block of one barrack finished. A suitable building for the branch school at Batála, in this District, was constructed out of Municipal Funds.

## Siálkot District.

64. A small school building at Mitránwáli, in the *Siálkot* District, was in progress, the cost being met partly from the General Local Fund and partly from District and Municipal Funds. Another school building at Jámki, to which all the above funds contributed, was finished.

## Lahore District.

65. Considerable progress was made with the construction of the new College and Normal School at *Lahore*, a large and handsome building on an elevated site and centrally situated. The lower storey of the building was completed, and the upper storey three-fourths finished. Two storeys of the tower were also completed, and the grounds about the building levelled and improved.

66. A school-house was constructed from District Funds at Bággbánpur, in the *Lahore* District.

## Jhelum District.

67. Materials were collected for additions required to the zilah school at *Jhelum*.

## GENERAL.

## Delhi District.

68. A considerable enlargement of the dispensary at *Delhi* to meet the requirements of the city was in progress from Municipal Funds.

## Gurgáon District.

69. A new and commodious dispensary building at *Gurgáon* was commenced, and about half completed by the close of the year, the cost being met from District Funds.

## Karnál District.

70. Three large dispensaries, the cost of which is being met from District Funds, were commenced this year at Pánipat, Kunjpura and Asandh, in the *Karnál* District. The building at Kunjpura was completed shortly after the close of the official year, and the superstructure of the other two was well in hand.

## Rohtak District.

71. In the *Rohtak* District, a dispensary at Gohána, commenced in the previous year, was completed; and a dispensary constructed at *Bahádurgarh*, both from District Funds.

## Umballa District.

72. A town-hall from Municipal Funds was constructed for the Municipality at *Umballa*. A first class dispensary from District Funds was in progress at Sádhaúra, in the *Umballa*



## BUILDINGS.

- District. At the end of the year the superstructure of the main building and of the quarters for Assistant Surgeon, &c., had been carried up generally to seven feet above plinth-level, and all the necessary materials for the buildings collected. Umballa District.
73. A corrugated iron roof, in lieu of the previous slated one, was provided to the Church at *Simla*. Simla District.
74. In the *Ludhiána* District, two new cattle-pounds were constructed, and watering troughs at certain encamping grounds. And a well was provided for the dispensary at *Jagrāon*. Ludhiána District.
75. The large and commodious dispensary at *Jullundur*, commenced in the previous year, was brought to completion, the cost of the building being met partly from District and partly from Municipal Funds. These funds also contributed jointly towards the construction of two other dispensaries in the *Jullundur* District, one at *Kartárpur* and another at *Banga*, both of which were completed during the year. Jullundur District.
76. A large town-hall for the meetings of the Municipal and District Committees at *Jullundur* was in progress, and at the close of the year the roofing only remained to be done.
77. A new dispensary was commenced at *Tándah*, in the *Hoshiárpur* District, and the superstructure of the building carried generally to five feet above plinth-level. Hoshiárpur District.
78. A new distillery was in progress in *Kulu*, *Kángra* District. Kángra District.
79. Work on the new Church under construction at *Dalhousie* was continued, and the main walls of the building carried up to level of top of the nave windows, the apse being also one-third completed. Gurdáspur District.
80. A suitable dispensary building was constructed at *Batála*, in the *Gurdáspur* District, from Municipal Funds.
81. The sessions house for Commissioner at *Siálkot*, commenced in the previous year, was finished. A dispensary was completed at *Raya*, in the *Siálkot* District, and a well provided for the leper asylum,—both works from District Funds. Siálkot District.
82. The additions in progress to the building occupied by the Accountant-General's Office at *Lahore*, to provide for the wants of the Paper Currency Office, were brought to completion. Two large rooms and verandah were added to the Lahore District.

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BUILDINGS.

## Lahore District.

Chief Court buildings at this station ; and the "mál-khána" attached to the Small Cause Court was enlarged, and a shed for suitors constructed.

83. A new room with verandah for *post mortem* examinations was added to the Lahore Lunatic Asylum. The reroofing and restoration of the "Montgomery Hall" at *Lahore* was brought to completion, and a sunk curtain wall with concrete floor constructed round the building to prevent settlement of the foundations. The necessary furniture for the Hall was also provided.

84. The town-hall near the "Delhi Gate" of the city of *Lahore*, to serve as a Court-house for Honorary Magistrates, was completed, the cost of the building being met from Municipal Funds.

## Ferozepore District.

85. The conversion of a bastion of the Tahsil at Moga, in the *Ferozepore* District, to serve as a rest-house for Civil Officers on tour, was in progress.

## Dera Ismail Khan District.

86. The sessions house for Commissioner, in progress at Tánk, in the *Dera Ismail Khan* District, was completed. Work on the new cemetery at *Dera Ismail Khan* was also finished. A new dispensary was constructed at *Kuláchi* from District Funds, to replace the old building washed away by floods in 1874.

## Shahpur District.

87. A dispensary was constructed from Municipal Funds at Sahiwál, in the *Shahpur* District.

## Jhelum District.

88. In the *Jhelum* District a new dispensary at Chakwál was in hand, the cost being defrayed by the District Fund. All that remained to be done at the close of the official year were the white-washing of the main building and the requisite out-offices.

## Bannu District.

89. A new bungalow was constructed for the Assistant Patrol of Customs at Miánwáli, in the *Bannu* District, to replace the former building washed away by floods of the River Indus.

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## Communications.

## COMMUNICATIONS.

## METALLED ROADS.

90. The metalling of 19 miles of the *Delhi* and *Mathra* road, from the Okla junction to Kaili, was continued, and the work completed, with the exception of the upper coat of metal in portions of the 7th, 8th, 24th and 25th miles. Delhi and Mathra Road.
91. Three miles of the portion of the *Delhi* and *Sirsa* road passing through the *Hissár* District were metalled. Delhi to Sirsa.
92. On the road from *Shahabad*, near Umballa, to *Jagádhri*, metal for part of two miles was consolidated, and metal collected for repair of five miles. New nurseries for roadside trees were established along the road. Umballa to Jagádhri.
93. About four miles of the Umballa and Kalka road received a new coat of metal, and metal for about five miles more was collected and stacked. Ordinary petty repairs to the bridges were carried out, and the special repairs of the Lálu and Debi nallah bridges completed. Umballa to Kalka.
94. Some new nurseries of trees along this road were established. A preliminary survey for a proposed diversion of about four miles from near Mubárákpur on the Gaggar to the Grand Trunk Road was in progress.
95. A survey was made for a new line of road to improve the communication between *Umballa* and *Náhan*. Umballa to Náhan.
96. The Grand Trunk Road from *Delhi* to *Umballa*, and on through *Amritsar* to *Lahore*, was maintained in good condition, though for a time the section between *Jullundur* and *Amritsar* sustained much damage from the extraordinary rains and floods of the year. Along the section between *Umballa* and *Phillour* many new nurseries of trees were formed. Delhi to Umballa and Lahore.
97. On the section of this road between *Ludhiána* and *Ferozepore*, 10½ miles received a new coat of metal, and metal for 17 additional miles was collected, besides execution of petty repairs along the whole line. New nurseries of roadside trees were also formed. North of *Ferozepore* a portion of the road was breached by the Sutlej in a heavy flood. The section of road over the old Sutlej bed was repaired. Ludhiána to Ferozepore and Lahore.
98. The section from *Ferozepore* to *Lahore* was maintained in good order, several miles remetalled, road buildings repaired, and roadside trees tended and watered.
99. The road from *Jullundur* to *Hoshiárpur*, and thence to *Dera*, in the *Kángra* District, was repaired, and plantations along it tended and watered. Jullundur to Hoshiárpur and Dera.

## COMMUNICATIONS.

Jullundur to Hoshiarpur and Dera.

100. On the section in continuation of this road to *Dharmśāla*, the right approach to the Beas was repaired, and new revetment walls built to replace those carried away by the heavy floods of the year.

Kapurthala to Kartarpur.

101. The metalling of the line of road from the boundary of the *Kapurthala* State to the *Kartarpur* Railway Station on the Punjab and Delhi Railway, commenced in the previous year, was finished.

Amritsar to Pathankot.

102. The road from *Amritsar* to *Pathankot en route to Dalhousie* was kept in good order and repair.

Sialkot to Wazirabad.

103. The metalling of the road from the Cantonment of *Sialkot* to the *Wazirabad* Station, on the line of the Punjab Northern Railway, commenced in the previous year, was completed all but  $1\frac{1}{2}$  miles. Metal for a second coat was also in course of collection. The unusual floods which prevailed in the summer of 1875 injured the embankment at several places, more especially in the 5th mile, indicating the need for a new flood-opening, which was accordingly provided at this point. The road is  $27\frac{1}{2}$  miles in length, with a width of 10 feet of metalling.

Kasur to Rāewind, Lahore District.

104. The line of road from *Kasur* to *Rāewind*, in the *Lahore* District, was maintained in good order, notwithstanding prevailing floods, and several miles were remetalled.

Mooltan to Sher Shah.

105. The usual repairs were executed to the metalled road from *Mooltan* to the *Sher Shah* ferry on the *Chenab*.

Mooltan to Dera Ghāzi Khan.

106. Much progress could not be made with the required improvements to the road from the right bank of the *Chenab* at *Sher Shah* to *Muzaffargarh* and *Dera Ghāzi Khan* for want of funds. Between the *Chenab* and *Muzaffargarh* three miles were finished, and work was in progress on the remaining two miles. Between *Muzaffargarh* and *Dera Ghāzi Khan* metal was in course of collection, and the improvement of about half a mile of the road near *Muzaffargarh* was effected.

Lahore to Peshāwar.

107. The Grand Trunk Road from *Lahore*, as far as *Jhelum*, on which the narrow gauge line of the Punjab Northern Railway is laid as far as *Wazirabad*, continued under charge of the Officers of the State Railway, an assignment being, as usual, made from Provincial Services for its maintenance.

108. On the section between *Jhelum* and *Rāwalpindi*, 68 miles, the usual annual repairs and necessary remetalling were executed.

## COMMUNICATIONS.

109. Between *Rāwalpindi* and *Attock*, 55 miles, the usual repairs were carried out, and the protective walling and railing, in progress at dangerous parts on this section, completed. From *Attock* to *Peshāwar*, 45 miles, the work of laying down a new coat of metal was in hand, and the consolidation completed on all but eight miles.

Lahore to Peshāwar.

110. Ordinary annual repairs and repair of bridges were attended to on the road from *Rāwalpindi* to *Murree*.

Rāwalpindi to Murree.

111. Work on the metalling of the road from *Peshāwar* to *Badhber* (towards *Kohát*) was suspended on account of the closure of the *Kohát* Pass.

Peshāwar District.

## UNMETALLED ROADS.

112. The roads from *Kalka* to *Simla* were kept in a fair state of repair, and the metalling of bad portions of the cart-road, chiefly between *Kalka* and *Solon*, was in progress. The blasting of the cliffs overhanging the cart-road at *Tára Devi* was completed.

Kalka to Simla.

113. On the *Hindustán* and *Tibet* road no works were in hand beyond the usual annual repairs.

Hindustán and Tibet Road.

114. It having been decided to restrict outlay on the *Kángra Valley Road* to such amount as would be required to open the road throughout from *Pathámkot* to *Pálapur* as a fair weather cart-road, without any more large bridges, and to accept the inconvenience of temporary obstruction to the traffic on the occasions of floods in the unbridged rivers, the works this year were directed towards completing the road in this sense, the recognized terminus of the cart-road, at the upper end, being the new station of *Pálapur*. The estimate for the entire project has received the sanction of the Secretary of State.

Kángra Valley Road.

115. During the year under review, a large quantity of dry masonry parapet work was completed on the most dangerous and precipitous sections of the road. The piece of unfinished road from *Chambi Khad* to *Ghurkarri* was completed. Temporary crossings were made over the *Chambi*, *Gaj*, *Barwi* and *Mánji* rivers, together with approaches thereto, thus enabling cart-traffic to pass with ease during fine weather from *Pathámkot* to *Pálapur*. Heavy revetment walls also were completed on the approaches to the *Chambi* and *Mánji* rivers, and a considerable amount on the *Bandarghát* incline.

116. Numerous culverts and minor bridges along the road were finished, and temporary crossings made over minor streams. Dry masonry irrigation culverts have been provided

## COMMUNICATIONS.

- Kángra Valley Road.** throughout. Embankments and cuttings, where most required, were dressed and grassed to prevent slips. The road has now been practically opened out for wheeled traffic along its entire length.
117. A rest-house for Officers on inspection tours was completed at *Kotla*.
- Kángra to Ladakh.** 118. Of the line of communication between *Kángra* and *Ladakh*, the part within Kashmir territory, over the *Lácha Lang* Pass, was considerably improved, the cost of the work being chiefly met by His Highness the *Mahárájah*.
- Patháńkot to Dalhousie.** 119. The usual repairs were executed to the road from *Patháńkot* to *Dalhousie*.
- Gurdáspur to Siálkot and Gujráńwála.** 120. And to the road stretching from *Gurdáspur* to *Siálkot*, and thence to *Gujráńwála*.
- Lahore to Shahpur.** 121. The road from *Lahore* to *Shahpur*, as far as *Pindí Bhatían*, was kept in good repair, and the plantations of trees maintained.
- Jhang to Dera Ismail Khan.** 122. The metalling of certain portions, and other improvements, of the road from the *Chícháwatni* Station on the Lahore and Mooltan Railway, through *Jhang* and *Bhakkar*, on to *Dera Ismail Khan*, was in hand. Thirteen miles of the road in the *Dera Ismail Khan* District were metalled, and wheeled conveyances now cross the *Thal* with comparative ease, excepting during parts of the rainy season.
- Deraját.** 123. The trunk and frontier roads in the *Deraját* were kept in repair to the extent of the funds available.
- Shahpur, Gujráńt and Jhelum Districts.** 124. The roads in the *Shahpur*, *Gujráńt* and *Jhelum* Districts, leading to the Salt Range, were maintained in good order.
- Hazára District.** 125. The required repairs and renewals were effected to the road between *Murree* and *Abbott-abad*, and to other trunk and frontier roads in *Hazára*. A renewal of revetment walling at the *Dhamtaur* nallah was in progress, as also the easing of gradients on the road to *Hasan Abdál*.
- Pesháwar District.** 126. The *Attock* and *Makhad* road was kept in good order, as also the *Doába* Outpost roads, and other lines to *Naushahra*, *Mardán* and *Kohát*.
- Kohát District.** 127. The widening and improvement of that portion of the *Kohát* and *Pesháwar* road over the *Mirkalán* Pass was in progress, and this section made passable for laden camels. The other roads, trunk and frontier, in the *Kohát* District, were kept in repair.

## COMMUNICATIONS.

128. Necessary repairs and various improvements, as far as funds admitted, were effected to the trunk and frontier roads in the *Bannu* District. Bannu District.

## DISTRICT ROADS AND BRIDGES.

(*The cost of these Works was met from District Funds*).

129. The road connecting Sonapat in the *Delhi* District, with the Grand Trunk Road at Balabgarh, was metalled and improved, and trees planted on the roadsides. The *Sonapat* and *Larsauli* road, and *Sonapat* and *Bhatgāon* road, in this District, were also raised and bridged. Considerable improvements of the *Kharkhauda* and *Bhāgpat* road, one of the most important lines of cross communication in the District, were in hand. The *Mehrauli* and *Toghlakabad* road was re-aligned, bridged, and partially metalled in sandy portions. This road opens up direct communication between *Mehrauli* and the principal towns of the *Balabgarh* Tahsil. Delhi District.

130. In the *Gurgāon* District, the *Gurgāon* and *Sohna* road was brought to completion, and five additional culverts provided; and a survey was completed of a proposed road from *Bahora* to *Taoru*. Gurgāon District.

131. Work was commenced on the construction of additional arches to the *Púran* Nallah bridge, in the *Karnál* District, and the project about half finished. Karnál District.

132. In the *Umballa* District, the road from *Burinjah* to *Kharwān*, and the raising and improvement of the road from the Court-house at *Rúpar* to *Bikan*, were completed. Two important works, the raising and improvement of the roads between *Ludhiána* to *Kalka* and *Rúpar* and *Karaoli*, were also finished. A bridge was also constructed over the *Pandhoe* nallah on the *Búriya* and *Kharwān* road; and several new plantations of trees established along roadsides in the District. Umballa District.

133. Six-and-a-half miles of the road from *Samrála* to *Máchiwára*, in the *Ludhiána* District, were metalled; and the metalling of the 10th and 11th miles of the road from *Dehlon* to *Ludhiána* was finished. The metalling and improvement of an old and very sandy road from *Dehlon* to *Kotla* was taken in hand, the earth-work completed, and metal collected and stacked. Another large project, the construction of a metalled road from *Dakha* to *Ráekot*, 14½ miles, was in progress, the first layer of kunkur consolidated, and bridges and culverts provided where necessary. Ludhiána District.

## COMMUNICATIONS.

## Jullundur District.

134. Four miles of the Jullundur and Nakodar road, in the *Jullundur* District, were metalled, and metal collected for the five miles on the other side of the Beyn river. The road from *Lisdráh* to *Ráhon*, which formerly in the rainy reason was quite impassable, was raised and improved. The metalling of the *Mandi* and *Phagwárah* road *viâ* Hatti, an important line, the improvement of which is expected to bring the hill traffic from parts of *Kángra* and *Mandi* direct to the *Phagwárah* Railway Station, was nearly finished by the close of the year. A small length of road joining the road to *Hoshiárpur* with the *Jullundur* City Railway Station was also metalled, and saves the *Hoshiárpur* and hill traffic a detour of two miles through the city on its way to the Railway. Three bridges were in progress in the District over the Beyn river on the *Banga* and *Garhshankar* road, one on the *Garhshankar* and *Nawashahr* road, and one on the *Phillour* and *Nakodar* road. The two former were finished, and the third nearly completed.

## Hoshiárpur District.

135. In the *Hoshiárpur* District, a small bridge was constructed on the road from *Mirthal* to *Bhetan*, which, however, was subsequently swept away by floods.

## Gurdáspur District.

136. Further progress was made with the metalling of the *Naushahra* and *Trimmu* road, in the *Gurdáspur* District, the work being extended year by year as funds admit. The raising and bridging of the *Batála* and *Beyt* road was also in hand.

## Siálkot District.

137. The road from *Sáilkot* to *Jummoo* was raised and improved, and the metalling of the 10th and 11th miles of the road to *Amritsar* nearly completed.

## Gujránwála District.

138. In the *Gujránwála* District, a wooden bridge at *Kot Mian Khán* was in progress, and a masonry bridge at *Jaldipur*. Another wooden bridge at *Dholan* was finished.

## Lahore District.

139. At *Nawakot*, in the *Lahore* District, an old wooden bridge of rough beams supported by masonry pillars existed across the *Mian Mir* drainage channel on the *Mooltan* road. This bridge being unsafe was demolished, and an arched masonry bridge substituted for it.

## Mooltan District.

140. In the *Mooltan* District, the foundations and arching of a bridge over the *Sardárwah* Canal, on the road from *Karor* to *Lodhrán*, were completed. Nine other smaller bridges, and a number of culverts, were constructed and in hand on other roads in the District.



## COMMUNICATIONS.

141. Seven miles of the *Khángarh* road, in the *Muzaffargarh* District, were metalled ; and two large bridges constructed on roads from *Jatoi* to *Shahr Sultán* and *Mudwála*.

*Muzaffargarh* District.

142. In the *Dera Gházi Khan District* there were no works of importance in hand, but minor improvements to roads in the District were effected in various localities.

*D. G. Khan District*

143. A portion of the road from *Shahpur* to *Jhelum* near *Kot Bhai Khan* was raised and improved.

*Shahpur District.*

144. In the *Hazára* District, the improvement of roads from *Pattán* to *Barangali*, from *Haripur* to *Ghází*, and from *Chamhad* to *Katuali*, was completed.

*Hazára District.*

145. The construction of road from *Kohat* to *Kharmatu*,  $5\frac{1}{2}$  miles, was in progress.

*Kohát District.*

146. A masonry bridge was constructed over the *Nári nallah*, on the *Hawaid* road, in the *Bannu* District.

*Bannu District.*

## BRIDGES.

147. The rebuilding of the bridge on the 5th mile of the *Delhi* and *Mathra* road, for which materials had been collected in the previous year, was finished.

*Delhi to Mathra.*

148. New spurs were constructed on the *Márkanda* river for the protection of the bridge near *Shahábad* on the road from *Delhi* to *Umballa*.

*Delhi to Umballa.*

149. Wing-walls on the down-stream side were added to the bridge over the *West Beyn* river on the *Grand Trunk Road* between *Ludhiana* and *Amritsar*, and a stone flooring also provided of boulders and block kunkur.

*Ludhiána to Amritsar.*

150. Metalled causeways over the *Beyn* at *A'lampur Kotla* were in progress, the cost of the work being met from District Funds.

151. The following bridges were completed at various points on the *Kangra Valley Road* :—A bridge over the *Manji* river at *Chaitru*, the large bridge over the *Dehri* river at *Kotlah*, the iron hand railing and roadway of the bridge over the *Seon* river at *Bhali*, and the iron girder bridge over the *Banganga* river at *Kangra*.

*Kángra Valley.*

152. The construction of a bridge over the *Nakair* stream between *Ránitál* and *Jawálamukhi* was also in hand, the cost being met from District Funds. The arches of the bridge were completed, but work was stopped for some months on account of a local outbreak of cholera.

## COMMUNICATIONS.

## Gurdáspur District.

153. The handsome masonry bridge, 5 arches of 30' span each, on the road from Dera Bába Nának, in the *Gurdaspur* District, to *Amritsar*, was completed.

154. The well foundations and superstructure of piers of a large bridge over the Naumáni river, on the *Gurdaspur* and *Siálkot* road, was in hand, but work was much hindered by the excessively heavy floods of the year. The cost of both these bridges is defrayed from District Funds.

155. Another masonry bridge, 3 arches of 30' span each, on the *Amritsar* and *Siálkot* road, at *Raya*, was in progress from District Funds, and was nearly completed at the close of the year.

## BOAT-BRIDGES AND FERRIES.

## Phillour.

156. The boat-bridges over the *Sutlej* river at *Phillour* were dismantled in April 1875 ; and again set up and opened for traffic in October 1875, the bridge across the right channel of the river, however, being maintained throughout the year.

## Ferozepore.

157. The single roadway boat-bridge over the *Sutlej* river at *Ferozepore* was dismantled in the close of May 1875, and again set up in the end of October. The boat-bridge at *Ganda Singhwala* was maintained throughout the year.

Shahdara near  
Lahore.

158. The bridge of boats over the *Ravi* river at *Shahdara*, near *Lahore*, was maintained throughout the year, except for about a week in August 1875, when it was broken through the pressure of heavy floods. A ferry was kept up while the boat-bridge was in course of reconstruction.

## Jhang District.

159. The bridge of boats over the *Chenab* river at *Trimmu ghát*, in the *Jhang* District, was dismantled in April, and reconstructed in October, and maintained open for traffic for the rest of the season.

## Montgomery District.

160. In the *Montgomery* District, a bridge of boats over the *Ravi* at *Chíchawatni* was maintained open throughout the year.

## Dera Ismail Khan.

161. Ten new boats, to be substituted for hired ones, were completed for the bridge of boats over the *River Indus* at *Dera Ismail Khan*, and some additional superstructure constructed. The bridge was removed in the middle of April, and re-established towards the close of October. During the interval the steamer "*Chenab*" plied as a ferry boat.

## Wazirabad.

162. The new superstructure for the bridge of boats over the *Chenab* at *Wazirabad*, in the *Gujrát* District, was com-

## COMMUNICATIONS.

pleted, and the bridge kept open for traffic during the winter season. It was dismantled in May, and a ferry employed from that time to the middle of October, when the bridge was put up for the season.

Wazirabad.

163. Some new superstructure was supplied to the boat-bridge over the river at *Jhelum*, chiefly on account of the lengthening of the bridge roadway by 600 feet, owing to increase in the width of the river. The bridge was dismantled in the middle of June, and again set up in the latter part of September.

Jhelum.

164. The bridge of boats over the *Jhelum* river at Pind Dádan Khan, in the *Jhelum* District, was dismantled in the latter part of April, and re-opened for traffic in the middle of September.

Pind Dádan Khan.

165. To replace old condemned boats in the bridge at Attock over the River Indus, two new boats were constructed, and three others were in hand. The bridge was dismantled and remained closed to traffic from the 1st of June to the middle of September. The plant of the boat-bridge and ferry was brought up to the sanctioned scale.

Attock.

166. The bridge of boats over the Kabul river at Naushahra remained dismantled for a short time during July and August. The boat-bridge over the same river at Nahakki, in the *Pesháwar* District, was maintained throughout the year.

Pesháwar District.

## ACCOMMODATION FOR TRAVELLERS.

167. The construction of the sarai at Gohána, in the *Rohtak* District, was brought to completion.

Rohtak District.

168. The sarai in progress at Shakargarh, in the *Gurdáspur* District, was also finished.

Gurdáspur District.

169. Progress was made with the construction of a sarai at Zafarwál, in the *Siálkot* District, the cost being defrayed by District Funds. The building was finished all but the roofing of the rooms for European travellers.

Siálkot District.

170. Three dák bungalows at Míran, Kuláchi and Hyndan, in the *Dera Ismail Khan* District, were constructed in lieu of old buildings washed away by heavy floods of the River Indus. The new buildings were erected on elevated sites at a greater distance from the river. A new sarai also was built at Míran to replace the old building destroyed by floods.

Dera Ismail Khan District.

## COMMUNICATIONS.

Dera Ismail Khan  
District.

171. District Funds contributed to the construction of a sarai at Tánk, and another at Kishna, in the *Dera Ismail Khan* District, both of which buildings are reported to be of great convenience and service to the countrypeople proceeding along those routes.

Ráwalpindi District.

172. A sarai was purchased and repaired at Chattar, on the road from *Ráwalpindi* to *Murree*.

Hazára District.

173. Work on the sarai at Hattar, in the *Hazára* District, was finally brought to completion.

Pesháwar District.

174. The sarai at Hoti Mardán, in the *Pesháwar* District, commenced in the previous year, was finished, and the new staging bungalow at Naushahra also completed.

Bannu District.

175. A sarai was completed at Kamarmasháni, in the *Bannu* District.

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## Miscellaneous Public Improvements.

## Mis. PUBLIC IMPTS.

176. Work was started on the project for a water-supply for the city of *Delhi*. An experimental well was sunk in the bed of the River Jumna to test the yield of filtered water obtainable in this way at various periods, and especially during floods. The reservoir on the ridge near the "I'dgah" was excavated, and some concrete laid down.

*Delhi District.*

177. An extension of the stone flooring of the slaughter-houses for cattle at *Delhi* was carried out, the accommodation being previously insufficient for public requirements.

178. Progress continued to be made with the paving of the streets and market squares in the town of Firozpur, in the *Gurgáon* District. The town is situated in a very sandy tract, and the paving of the streets, which is being effected, will supply a great desideratum.

*Gurgáon District.*

179. The improvement of tanks and "johars" at various localities in the *Karnál* District was in progress, and the sanctioned estimate nearly worked up to.

*Karnál District.*

180. Operations on the trial boring of an Artesian well at Bhiwáni, in the *Hissár* District, were in progress from Municipal Funds. A depth of 303 feet was attained, but the water reached was still quite brackish and undrinkable. Specimens of the various descriptions of soil passed through, and some fossil remains which were found, have been preserved, and the boring is being continued in the hope that a supply of potable water will eventually be obtained.

*Hissár District.*

181. The work of paving four sections of streets in the town of Gohána, *Rohtak* District, was well advanced.

*Rohtak District.*

182. Two bathing-gháts were constructed at the Rájuwála and Ganga Ságar's tanks, in the town of Jagádhri, *Umballa* District.

*Umballa District.*

183. An egg-shaped covered discharge, or escape drain, in the *Ludhiána* city, connected with the old open sewer, and carrying away all the sewage underground to the left of the Railway Line, was completed, and is reported to be of much advantage to the city.

*Ludhiána District.*

184. The paving of streets of towns in the *Ludhiána* District was in progress, and a bathing-ghát was constructed at *Máchhiwára*.

185. The metalling of the "Basti Shekh" road at *Jullundur*, connecting the city with its largest suburb, was in hand. The necessary earth-work was finished, metal collected, and the consolidation only remained to be done.

*Jullundur District.*

## MIS. PUBLIC IMPTS.

## Hoshiárpur District.

186. Twenty-nine new wells were constructed at various places in the *Hoshiárpur* District, and large grants-in-aid made from District Funds for the deepening and improvement of tanks and wells in hilly tracts. Useful improvements of a minor character were effected in several towns in the district.

## Gurdáspur District.

187. The fullest success attended the protective works completed this year for the protection of the town and shrine of Dera Bába Nának in the *Gurdáspur* District from the encroachments of the Ravi. The main features of the scheme consisted of bunds across the low water channels two miles above Dera Nának ; parallel leader cuts to take off the water thus obstructed ; a diversion channel formed by widening a natural escape, and to which almost the whole volume of the Ravi has been diverted ; and floating spurs known as " Brown-low's weeds," which proved most efficacious in producing silt and barring the escape of water at various points in the bunds.

188. The approximate discharges of the diversion channel on successive dates were as follows :—

4th April 1875	...	...	$\frac{1}{4}$	of the Ravi discharge.
6th May	"	...	$\frac{3}{8}$	" "
20th July	"	...	$\frac{1}{2}$	" "
15th Sept.	"	...	$\frac{3}{4}$	" "

and on the 4th November 1875 the old bed opposite the town was quite dry, and the ferry boats removed to the diversion.

189. A commencement was made with the provision of steps to the Shamsher Khánwála tank, *Gurdáspur*, the cost being met from District Funds.

## Gujránwála District.

190. Materials were collected for the proposed masonry drain to the Palku nallah near *Wazirabad*. The construction of a large masonry tank at Háfizabad, in the *Gujránwála* District, was in hand, and the work nearly finished. Nineteen houses were completed for Patwáris at several places in the district.

## Lahore District.

191. The Palace in the Fort of *Lahore* was thoroughly repaired and restored, the painting of the walls and coloring and gilding of the several rooms were renewed, and the marble work cleaned. Various improvements to the Palace buildings were also effected.

192. The tomb of Mahárájah Ranjít Singh at *Lahore* was replastered, and the interior of the tomb repaired and restored. The renovation of the tomb of the Emperor Jahángír at *Shahdara* was also in hand, and much of the stone and plaster work thoroughly repaired. The various buildings and fountains in the Shálimár Gardens near *Lahore* were put in thorough order.

## Mis. PUBLIC IMPTS.

Lahore District.

193. On the occasion of the visit of His Royal Highness the Prince of Wales to *Lahore*, ornamental barricades were set up on all the cross roads about the city and suburbs.

194. The reconstruction of the "Bhāti," "Khizri," and "Kashmīri" gateways of the city of *Lahore* was in hand, and the masonry work in each finished. The buildings of the "Bhāti" gateway will contain accommodation for a large body of the Municipal Police. The elaborate surveys for the *Lahore* city sewerage and water-supply projects were completed.

195. At Kathála, in the *Lahore* District, the masonry bathing ghát, the scene of a large annual fair, was extended.

Ferozepore District.

196. Head works were excavated for canals known as "Daulatwah" and "Firozwah" in the *Ferozepore* District, and aid given from District Funds for the excavation of 7 other canals and 14 tanks and 3 wells in the district, which have proved of much benefit to agriculture. Materials were collected for a masonry tank at *Mihraj*.

197. Other works of importance carried out at *Ferozepore* from District and Municipal Funds were as follows :—The metalling of a road from the city to the Grand Trunk Road near the cemetery ; the construction of an aqueduct to provide water for the city tanks and gardens ; a masonry wall round the cremation ground ; and several masonry drains and culverts in and about the town.

Montgomery District.

198. In the *Montgomery* District, a masonry tank was constructed from District Funds at *Okráli*. Municipal Funds defrayed the cost of three masonry tanks completed at *Montgomery*, *Sayadwála* and *Karwália*.

Mooltan District.

199. In the *Mooltan* city, the streets from Masjid Wali Muhammad to "Pák" gate, and from Kakrán to Gopiwála street, were paved and improved.

Dera Ismail Khan District.

200. A large masonry drain of considerable utility was constructed at the Powinda gate of the town of *Dera Ismail Khan*. The paving of the main streets of the town was nearly completed.

Shahpur District.

201. In the *Shahpur* District, a masonry tank was constructed at *Sakesar*, and a kacha tank on the *Kund* and *Khusháb* road.

Jhelum District.

202. The protective works at the Khewra gorge in the Salt Range, *Jhelum* District, suffered much damage from floods, and new masonry retaining walls became necessary to protect the road and the weighing-yard. The bathing-tank at Khewra was also improved and enlarged.

## MIS. PUBLIC IMPRS.

## Jhelum District.

203. A Municipal work of much importance which was in hand at *Jhelum*, was the masonry embankment along the river bank near the town and station for protection from the encroachments of the river. About three furlongs of the embankment were completed.

## Ráwalpindi District.

204. The metalling of the "Chúhar" road from the town of *Ráwalpindi* to the Grand Trunk Road was finished; a bridge was completed from Municipal Funds over the Leh river on the road to Pesháwar; and the masonry tank at *Hazro* in the district brought to completion.

## Hazára District.

205. Tanks for males and females, for bathing purposes, were constructed at Naushahra in the *Hazára* District; and another tank near Haripur.

## Kohat District.

206. A masonry tank was completed at Topi, in the *Kohát* District.

## Peshawar District.

207. An aqueduct was in progress to convey the water of the Shekh-ka-Kattra irrigation-channel over the main sewer of the *Pesháwar* city. Considerable progress was made with the improvements of the city drainage; and a large number of unsightly mounds and hollows outside the city were removed, and a broad road with trees thus provided around the walls.

208. A disastrous conflagration in the city in May 1875 destroyed about 2000 buildings, and the removal of the débris of these was undertaken from Municipal Funds.

209. The roads of the Shahi Bágh public gardens at *Pesháwar* were raised, widened and improved.

Exploration of  
Bhuddist ruins.

210. The exploration of the mounds at Takkal, in the *Pesháwar* District, was resumed in the cold season of the year under review. The mounds are two in number, one of a height of about 35 feet over original ground-level, the other of about 70 feet. The only sculpture discovered was a small slab with figures in relief of three persons crowned with snakes. A brief account of the result of the season's operations was communicated to the Director-General of the Archæological Survey of India, and published in the *Punjab Gazette*.



## PART III.—(IMPERIAL) IRRIGATION.

### CHAPTER I.

211. Before proceeding to review in detail the progress made on the various works during the year, it will be interesting and appropriate to notice briefly some of the most important events which have occurred, and matters which have been considered.

Introductory.

212. From the end of July till nearly the end of September, there was an unusually heavy rain-fall in some parts of the Province, whilst in others it was under the average. The distribution indeed is not easily accounted for, the heaviest falls outside the line of the Himalaya not being, as is usual, close to their base, but at most irregular distances and in localities often comparatively rainless.

Heavy rain-fall in August.

213. At *Mádhopur* and in the hills in its neighbourhood more rain fell between the 1st and the 11th of August than the average fall for that month. From the 8th to the 12th or 13th the storm appears to have been general all over the tract of country watered by the *Bári Doáb Canal*, and to have extended by the town of *Kasúr*, which it nearly destroyed, far down the *Sutlej khádír* in the *Montgomery District*. The rain-fall whilst the storm may be said to have lasted was approximately—12 inches in three days in the neighbourhood of *Gurdáspur*;  $26\frac{1}{2}$  inches in five days at *Amritsar*; 23 inches in eight hours is reported to have fallen at *Kasúr* (a most extraordinary fall which requires corroboration);  $22\frac{1}{2}$  inches in four days were measured at *Mámoki*; and at *Dipálpur*  $12\frac{1}{2}$  inches fell on the same days.

Distribution of the rain-fall.

214. The floods consequent on this storm were, as might be expected, exceptionally heavy. The *Bári Doáb Canal* was closed on the 10th August; but, in spite of that, and with the *Kiran* escape open, there was a heavy flood-supply passing from *Aliwal* down both the *Main Branch Lower* and the *Lahore Branch*; the drainage water from the 1st Division having burst into the channel. After this had been carried for many miles, it burst the banks and escaped, relieving the tail works. The native built mills with their mud walls were almost without exception swept away.

Consequent floods.

215. But the most severe strain to which any part of the canal was exposed, was experienced in the 3rd Division, or

*Kasúr* and *Sobráon Branches*.

## IRRIGATION.

Kasúr and Sobráon  
Branches.

Kasúr and Sobráon Branches. These were new works, the excavation and banks but recently completed, and the masonry almost green. On the morning of the 10th August, the whole tract of country through which these channels run was under water. It was six inches deep at *Tibri*, and seven miles down at *Sathiali* two feet, which depth over the surface of the country was preserved to the tails of both branches. Some distance below *Sathiali* all trace of the canal was lost, save here and there where the parapets of a raised bridge or fall were visible above the flood. It is satisfactory to be able to report after such a test that the masonry works were scarcely injured.

Head works at Mád-  
hopur.

216. The damage to the head works at *Madhopur* though considerable, was but a foretaste of what was to come later in the season.

## Upper Sutlej Canals.

217. On the *Katora*, one of the Upper Sutlej Inundation Canals, the damage was considerable. The water flowed level with the roadway of the wooden bridge carrying the *Chunián* and *Ferozepore* road, did great damage to the *ráj-bahás* which were under construction, and bursting over the country ruined some 12,000 acres of fine crops. As a set off, however, to this, it may be mentioned that these and subsequent floods have enabled the largest rabbi crops ever recorded to be raised.

## Next heavy flood.

218. The next heavy flood was about the 9th and 10th September. Its consequences were most severely felt at *Madhopur*, and, strange to say, during the same days at *Delhi* and in that neighbourhood. The level of the surface of the River Ravi at *Sidhauri* was the highest ever recorded; the rain-fall in the higher hills of the valley of the river must have been extraordinary, as so much timber was brought down. Eighty-three logs passed through the raft-opening in one minute. This flood on subsiding left the head sluices high and dry, the river took to the *Jummoo* side half a mile distant, and the prospects of maintaining a supply looked sufficiently gloomy.

## Last heavy flood.

219. The work which was done during the day was swept away at night, owing to a more or less constant rain-fall in the hills, which kept a large volume of water in the river. Finally, another flood on the 26th September completed the destruction of the head works, and the canal was supplied by opening the old head channel which was closed when the weir was built. The river gradually diminished in volume after this, and the repairs described in the body of the report were executed.

## IRRIGATION.

220. Early in the season reports from remote parts of Gilgit were received that a glacier, or the side of a hill, had fallen, damming up the river and forming a large lake ; whilst at the same time the waters of the Indus in British territory were lower than usual.

Obstructions in the upper waters of the Indus.

221. As it was not known precisely at what locality the obstruction had taken place, nor whether it was of a nature to have caused floods similar to those of 1841 and 1858, warning was sent to all Officers through whose Districts the Indus flows.

222. Further enquiries were made through the Vakíl of Kashmir, and it was ascertained that the obstruction, whether glacier or landslip, was at the foot of a lake called Ishkomán, situated in a valley of that name which lies east of Yássín. It was manifest that no obstruction in so remote a quarter could have any perceptible influence on the River Indus in British territory.

223. Some observations were made by Mr. Higham to ascertain the loss on these accounts in different parts of the Bari Doáb Canal. Interesting results were obtained, and a report embodying them was forwarded to the Government of India.

Absorption and evaporation.

224. The question of improving the irrigation in the Trans-Indus part of the *Dera Ismail Khan* District was again taken up, and an Officer was deputed to obtain information on which to base an estimate.

Irrigation in the Dera Ismail Khan District.

225. The orders of the Government of India on this project were received in November, and the sanction of the Secretary of State to the estimates has been since intimated ; arrangements are in progress for starting the work at the commencement of the cold season.

Swát River Project.

## CHAPTER II.

## 1ST DIVISION BARI DOAB CANAL.

226. *Original Works.*—The substitution of burnt pipes for the old wooden water-course heads was carried out during the year, but in all probability some additional ones will have to be fixed.

Permanent water-course heads.

227. *Minor Works.*—Concrete arches were substituted in No. 1 rapid for the old wooden bridge.

Concrete arches.

228. *Repairs and Maintenance.*—The effect of the floods on these works and the consequent repairs will be detailed in the report of the Special Works Division. At *Behri*, the upper

Head works, weir, &c.

## IRRIGATION.

Head works, weir, &c. spur for the protection of the *Salámpur rájbaha* withstood the floods, and remained intact; the lower one was completely destroyed, and will not be renewed unless the action of the river becomes such as to require its reconstruction.

Masonry works. 229. The masonry works were thoroughly examined and repaired during the closure which was made from the 25th March. The dam and regulator are reported to be in good order, the masonry works of the canal generally not having been seriously damaged by the floods which passed down. A deep hole was formed down-stream of the flooring of the *Tibri* regulator.

Rájbahás. 230. The heavy floods tested the culverts and other drainage works most severely. The superpassage at *Alúwál* on the *Sirkíán* rájbaha was entirely destroyed, and the banks near *Suparán* washed away.

231. As there is very little irrigation below *Alúwál*, the rájbaha will not be repaired; a project for an escape back into the canal is supported by the Superintending Engineer. The *Talwandi* and *Ghuman* rájbahás also suffered considerable injury to their banks. No masonry work was, however, damaged.

Drainage and Hill  
Torrent Works. 232. The various drainage works have been thoroughly repaired. Slight injuries to the works at *Dhangu* are reported; but, on the whole, they have stood well. These drainage channels worked efficiently, and nothing beyond a few spurs and ordinary repairs are required.

Nalwa and Sujánpur  
cut.

Kanowán Drainage. 233. The tail of the drain in the *Kánowán* jhíl was nearly obliterated. The local Revenue authorities have been asked whether a fair return may be expected on further expenditure, as it appeared to be doubtful whether the results of repairing the damage would justify their cost.

Plantations. 234. Two hundred and fifty young Bombay mango plants were grafted; the existing trees were tended; a small area was prepared for sowing.

Observations of discharge of rivers, &c. 235. The Executive Engineer, Captain Garstin, reports the following as the result of his observations:—

RIVER RAVI.				RIVER BEAS.			
Date.	Place.	Discharge.		Date.	Place.	Discharge.	
		C. ft. per sec.				C. ft. per sec.	
19th April 1875	Mádhapur	...	7,967	19th April 1875	Naushahra	...	6,617
25th July	"	(flood)	146,982	19th Octr.	"	...	18,862
8th Dec.	Sidhauri	...	2,593	8th Dec.	"	...	5,416
15th Jany. 1876	"	...	2,902	15th Jany. 1876	"	...	4,745
20th March	"	...	6,494	20th March	"	...	6,003

## 2ND DIVISION BARI DOAB CANAL.

## IRRIGATION.

236. *Original Works.*—The construction of the *Tham-man* and *Turkwind* rájbahás was transferred from the Special Works to this Division. The excavation was well pushed on—of the first channel two-thirds, and of the second five-sixths were finished. The various masonry works and inspection bungalows were in progress. It is reported that the channels will be ready by the rabbi of 1876. Original Works.

237. Alterations to some of the weirs in the Main Weirs. Branch Lower were effected.

238. The 2nd class rest-house at *Gulpan* was improved, Rest-houses. and additions made so as to enable it to be used by Inspecting Officers. Some out-offices were built at the various rest-houses on rájbahás.

239. Silt-clearance was effected where the width of the channel had become seriously contracted and tortuous. Repairs and Maintenance.

240. During the floods a large breach, roughly 200 feet long by 30 feet deep, was made in the left bank of the canal, about 12 miles below *Aliwal*; some smaller gaps being made lower down. The usual supply had fortunately been shut off, and the flood-water was carried in the canal past *Amritsar* to the 47th mile near the village of *Kalsian*, where, proving too much for the channel, it burst the left bank and caused some damage to the standing crops. There was a serious breach made near the Cantonment of *Meean Meer*: an escape was cut above it, and the water diverted into the large drain which leads to the *Ravi*. An arch of this bridge was taken down and rebuilt. The operations under this head were very trifling, consisting of thinning and planting out. Breaches.  
  
Lahore Branch.  
  
Mír Muhammad Bridge.

## 3RD DIVISION BARI DOAB CANAL.

*Kasur and Sobráon Branches.*

241. Satisfactory progress has been made throughout the year. The works were exposed to the floods mentioned in the reports of other Divisions, which burst the banks and carried them, and a great deal of the spoil, back into the bed, which was in places silted up from  $2\frac{1}{2}$  to 3 feet above its proper level. On the subsidence of these floods the banks were repaired, and the bed again excavated. Nearly ninety-two lakhs of cubic feet of earth-work were dug out, and the bed was again nearly ready to receive water. General.  
  
Excavation.

## IRRIGATION.

## Masonry Works.

242. The rest-houses were completed during the year, and did not suffer from the floods, although in one instance water stood 11 inches above the floor. The out-offices, however, suffered somewhat, but they have been repaired, and are all fit for use.

## Bridges and Falls.

243. With the exception of the 10-foot fall at *Patti*, at the tail of the Sobráon Branch, and the additions of steps to some of the others, these works were complete. They were most severely tried by the floods, the water in many instances being level with the up-stream wing-walls, and only a foot below the crown of the arch down-stream ; yet in no case was a brick displaced, or a sign of settlement in the masonry visible.

## Bridges.

244. The bridges originally contemplated are finished. It is, however, intended to build a few small foot bridges for the convenience of villagers whose lands are divided by the canal, and are not in the immediate vicinity of a regular bridge. The cost of these works will be trifling, and will be met from savings on other items of the estimate.

## Regulators.

245. The *Tibri* regulating head was commenced in March, and completed within the month, save the pointing and finishing.

## Admission of water.

246. In February a small supply of water was admitted for grassing and consolidating the banks : this continued flowing till the closure of the main canal on the 25th March.

## Distributaries.

247. The courses taken by the flood-water down the various drainages necessitated a complete revision of the scheme for distributaries. The surveys are nearly complete, and detailed projects are well advanced.

## SPECIAL WORKS DIVISION.

## Works in charge of the Ex. Engr.

248. To this Division was entrusted the remodelling of the Main Branch Upper, the construction of the weir and head works, and the completion of the distributaries.

## Damage to the head works.

249. As might be expected, the head works suffered most severely from the heavy floods.

250. The damage sustained is thus briefly described by Lieutenant Jacob, R. E., the Executive Engineer—

“ The rapid below the outlet was cut back by the action of the river ; a hole was formed down-stream of the outlet deeper than the foundations, and the work was accordingly breached. On the right bank the river cut out a deep channel through the alluvial land, the spurs at the right abutment were carried away, and the abutment of the weir was outflanked.”

## IRRIGATION.

251. Colonel Brownlow was promptly on the spot, and, in consultation with Mr. Higham and Lieutenant Jacob, prepared designs for new undersluices, for modifications of the inlet, and for repairs to the weir. A system of protective and training works was also projected.

Damage to the head works.

252. As it was of vital importance to push on these repairs and works at all hazards in order to secure a supply in the canal, and as this could only be done by concentrating the whole establishment of the Division at *Mádhopur*, the *Thamman* and *Turkwind rájbahás* were made over to the 2nd Division, and the remodelling of the Main Branch Upper to the 1st Division.

Arrangements for repairs.

253. Work on the repairs commenced in September, but was at first constantly interrupted by floods, the work done during the day being carried away at night. Throughout October the river remained very high, and work accordingly progressed but slowly. But gradually by constant perseverance an impression was made; foundations were unwatered by centrifugal pumps; and new work was put in  $11\frac{1}{2}$  feet deeper than the old. These and the flooring of the undersluices were completed by January, and the superstructure was commenced: good progress was made up to the end of the year, by which time the piers were built to the level of the girders, and the gates and gearing were about half finished.

254. Good progress was likewise made with the training works, which were reported as drawing towards completion by the close of the year.

255. The responsibility of carrying out and completing these works devolved on Lieutenant Jacob, whose arrangements have been most successful. Colonel Brownlow, before leaving the Province, brought this specially to the notice of the local Government.

## MADHOPUR WORKSHOPS.

256. The various buildings are reported to have stood very well, and to have required but little repair.

Buildings.

257. The machinery worked satisfactorily. An alteration in the method of working the machinery of the lathe-room was sanctioned during the year, and was completed in October. It consists in using a diagonal shaft and bevil wheels, thereby effecting a great saving in belts; and the Executive Engineer reports that it is a great improvement on the old arrangement.

Machinery.

258. The water-wheel was lifted out of its bearings, which were reversed, the lower ones having become a good deal worn. It was also otherwise overhauled and repaired.

Water-wheel.

## IRRIGATION.

Out-turn from  
Foundry.

259. The out-turn was larger than usual, owing to the quantity of work executed for the new outlet or undersluices of the canal. The total weight of castings during the year was 1489 maunds, against 871 maunds last year.

Smiths' Shop.

260. 1469 maunds of forge work was turned out. These shops have also been much employed on canal work.

Carpenters' and Pat-  
tern-makers' Shop.

261. Principally employed in making patterns for the gearing for the undersluices. An order has been received for making silk-reeling machinery.

Stores.

262. Mr. Watson reports that some of the stores suffered in consequence of the heavy rains and insufficient shelter; and proposes remedial measures. These will be separately considered.

## LOWER SUTLEJ AND CHENAB DIVISION.

Original Works.

263. No original works of any importance were constructed during the year.

Maintenance and  
Repairs.

264. The usual silt-clearances were effected, the rest-houses repaired and white-washed, and the plantations tended and watered.

Zarnágha or Fine  
Fund.

265. Some extensions and improvements to existing canals were carried out during the year, and charged to the Fine Fund.

Chenab Embankment.

266. This embankment was breached on the 10th of August. Arrangements for its repair have been made.

Observation of the  
discharge of the  
Ravi.

267. The usual observations in December and January were made, and the discharges were calculated to be 2112 and 2006 cubic feet per second respectively. There was a much larger supply of water in the river throughout the year than is usual.

## KARNAL DIVISION, WESTERN JUMNA CANAL.

Original Works.

268. There are no operations of interest or importance to record under the head of Original Works.

Repairs and Maintenance.

269. The various bunds or river-training works were breached in the floods, and afterwards repaired. The water in the escape having for the last year or two cut deeply into the right bank, it became necessary to take special means for its protection. Captain Ottley, R. E., reports as follows:—

"The work consisted of an earthen bund thrown across the mouth of the old (*Bádshahi*) heads, and raised to a height of three feet above the



## IRRIGATION.

highest water-mark of last year's flood; a floating tree-spur just above the mouth of the heads, intended to divert the rush of the water into the proper channel; and, finally, another long floating tree-spur at the point where the Jumna waters had broken in, intended to keep the current away from the right bank, where it had already cut out a deep elbow."

Maintenance and Repairs.

270. Considerable repairs to the flooring down-stream of the dam were made at a cost of Rs. 1,636.

Dam at Dádúpur.

271. Gates were made for this work.

Budha Khara Regulator.

272. The following observations and calculations of discharge were made during the year :—

Observations of volume discharged by the Jumna.

## RIVER JUMNA.

<i>Date.</i>	<i>Place.</i>	<i>Discharge.</i>
21st December 1875 ...	Railway bridge ...	1,182 c. ft. per sec.
22nd January 1876 ...	Ditto ...	2,363 " "
22nd August 1875 ...	Hathni Kund ...	35,307 " "
16th September " ...	Ditto ...	30,071 " "
18th September " ...	Ditto ...	23,850 " "
3rd October " ...	Ditto ...	19,113 " "
6th October " ...	Ditto ...	15,500 " "
10th October " ...	Ditto ...	12,590 " "
18th October " ...	Ditto ...	9,465 " "
18th December " ...	Ditto ...	4,307 " "

## EASTERN JUMNA CANAL, 2ND HEAD.

18th December 1875 ...	Near mouth ...	517 " "
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## WESTERN JUMNA CANAL.

7th September 1875	Budh	3,792 " "
18th December "	Tájawálah cut	3,658 " "
19th December "	2nd mile below Dádúpur	2,517 " "
19th January 1876	Ditto	854 " "

273. Operations were confined to maintenance.

Plantations.

## DELHI DIVISION.

274. The rájbaha known as No. IX. was transferred from the Special Works Division. It is not yet complete, but it is used for irrigation.

Original Works.

275. The construction of burnt cylindrical pipes for permanent water-course heads was continued throughout the year. It is reported that nearly sufficient were made for present requirements.

276. The usual jungle-clearance was made, and some bridges were raised.

Maintenance and Repairs.

## IRRIGATION.

## Mills at Delhi.

277. Some small repairs to the Delhi mills were required consequent on the damage by the heavy floods.

## Bowána escape.

278. The banks of the Bowána escape were breached, and have been repaired.

## Plantations.

279. Plantations have been maintained. The number of monkeys, and the impunity with which they are permitted to commit their depredations, have rendered any extension of plantations unadvisable. Advantage has not, therefore, been taken of the permission of the Government of India to appoint trained foresters on this Division of the Canal, and expenditure is reduced to the minimum, which is consistent with keeping the existing trees in good order.

## DELHI AND GURGAON WORKS.

## Delhi and Gurgáon Works.

280. These works form a Sub-division of the Delhi Division. They consist in a great measure of embankments across natural drainage lines which hold up the water till it forms a lake from which, or round the edges of which, irrigation is practised. Such works naturally suffered most severely during the monsoon. Indeed, the damage was so extensive and the repairs likely to be so costly, that the question has been raised as to whether it would not be prudent to abandon the maintenance of most of them, especially as year by year they involve a considerable direct loss of money.

281. The main works, such as the Najafgarh jhíl, and possibly the Kotla and Chandáni jhíls, will remain under this Department; but pending an ultimate decision, no extensive repairs will be undertaken. The rain-fall which caused the great damage amounted to 23 inches in 36 hours—a quite unprecedented fall in this locality.

## HANSI DIVISION.

## Original Works.

282. Some progress was made in collecting materials for the second class chauki at *Mowána*; the foundations were excavated.

## Maintenance and Repairs.

283. Some of the old chaukís have had verandahs built round them—a great improvement, and one which adds much to the comfort of Inspecting Officers.

## Silt-clearance.

284. Considerable clearances have been effected. The Hánsi branch was cleared to a depth of one foot from Rámra near the town of Jínd, to Mingni Khera, below Hissár, where the Darba and Bahádra branches separate. The Bahádra branch was cleared to Jhánsil, some 13 or 14 miles from Mingni Khera. The Butána branch also was cleared. The usual jungle-clearances were carried out, and plantations were maintained.

## HEAD WORKS DIVISION.

285. Fair progress is reported in the masonry; the quantity done in the year was somewhat smaller than that of the previous year, and this is accounted for by delay in getting to work after the monsoon, owing to the difficulty in stopping the leakage of the supply bunds, and also to modifications made in the design by the Inspector-General. The weir was completed on the 10th June. The foundations and flooring of the Western Jumna Canal undersluices were complete; the piers being built to a height of 12 feet above the flooring. The longitudinal walls and the underflooring of the Eastern Jumna Canal undersluices were complete, and about two-thirds of the boulders-on-end covering finished. The Western Jumna Canal head sluices were complete, except the coping of the down-stream parapet, and the boulder pitching of the slopes below the wing-walls.

286. About three-fourths of the masonry of the Eastern Jumna Canal head sluices is finished; thirteen arches have been turned; and the gates are ready to be put in.

287. The masonry of the lock-channels is far advanced.

288. Good progress is reported. Some of the channels which had been dug out were filled up by the floods, and have to be re-excavated. The right protective embankment was finished before the rains, but was breached in a flood, the consequence of which is that the amount of work done considerably exceeds the provision in the estimate.

289. The tramway introduced by Mr. Duncan, the Executive Engineer, for carriage of materials, has worked satisfactorily, and has, he estimates, effected a saving to Government of upwards of ~~Rs~~ 12,000 on the cost of carriage.

290. The floods in these upper waters of the Jumna were neither so numerous nor so long continued as is often the case. There were three, however, exceptionally high ones: on the 2nd August when the water reached  $25\frac{1}{2}$  feet on the Hathni Kund gauge; on the 5th of the same month the water stood  $23\frac{1}{2}$  feet; but the most remarkable was that of the 11th September, on which day the water rose from 14 feet on the 10th to 24 feet on this gauge. The fall during the next few days was nearly as rapid as the rise.

## NEW MAIN LINE DIVISION.

291. *Preliminary Works.*—This Division, which was constituted during the previous year, is entrusted with the construction of the new line from Indri, near which it enters the *bāngar* or high land, towards Rer.

## IRRIGATION.

Weir and head works of Eastern and Western Jumna Canals.

Undersluices, Western Jumna Canal.

Undersluices, Eastern Jumna Canal.

Earth-work.

Tramway.

Floods.

Main Canal and Branches.

## IRRIGATION.

Main Canal and  
Branches.

292. The line has been demarcated, with the exception of that part which lies in the state of His Highness the Rájah of Jínd, in which the land has not yet been acquired. Benchmarks along the centre line have, with the same exception, been built. Compensation has been paid for all land taken up, and the only outstanding under this head is a small sum for jágírdár rights in the village of Dhamanheri.

## Compensation.

## Buildings.

293. Two rest-houses have, under the special permission of the Local Government, been commenced, in order to have sufficient shelter for Officers and Subordinates when work is opened out in their neighbourhood. That at Jáni is nearly finished; the other at Rhamba was delayed for want of iron trusses for the roof. Both houses are built on the plan which has been adopted in the North-Western Provinces for first class chaukís.

## Rájbaha No. IV.

294. This was made over by the Special Survey Division, which was abolished towards the end of the year. It is reported as complete.

## Collection of materials.

295. This is confined to the collection of kunkur and boulders, and brick-burning. Progress is reported to be satisfactory, and sufficient materials will be on the spot to enable the masonry works to be commenced when their designs and detailed estimates have been sanctioned.

## NEW DELHI BRANCH DIVISION.

## Projects.

296. This Division, like the preceding, was formed to take up part of the remodelling work, and, as its name indicates, the part assigned to it consists of the re-alignment and rectification of the Delhi branch, and the project for navigable connection with the Agra Canal at *Okla*.

297. The plans and estimates for the first of these schemes were submitted by the Executive Engineer, but had to be returned for modification.

298. Fair progress is reported with the *Okla* navigation channel designs.

## Rájbaha No. XII.

299. This rájbaha has been partly demarcated.

## Surveys.

300. The following figures are reported to represent approximately the extent of survey during the year :—

222 miles levelled,  
1011 „ surveyed,  
291 „ plotted.

## Materials.

301. The collection of materials is in progress; stone being quarried and collected on the ridge at *Delhi*, carried to the Andha Mughal bridge, and thence transported on barges to the sites of the various works.

## IRRIGATION.

302. As in the New Main Line Division, the land required for the New Delhi Branch was obtained by private negotiation. The District and Settlement Officers were consulted, and the papers and records of sale were approved by them.

Land acquisition and compensation.

## SPECIAL SURVEY DIVISION.

303. As remarked in the notices of these Divisions, the rájbahás Nos. IV. and IX. were transferred when all but complete to the New Main Line and Delhi Divisions; the Special Survey Division being closed on the 1st February. This reduction was effected with the wish to reduce the proportion of cost of establishments to cost of works.

Transfers.

## LOWER BARI DOAB CIRCLE.

304. The following report on the operations in the Upper Sutlej Canals and Special Survey Divisions is extracted from that by Colonel Earle, Superintending Engineer, who succeeded Mr. E. C. Palmer, Officiating Superintending Engineer, on the 7th December :—

## UPPER SUTLEJ DIVISION.

305. The expenditure on Capital was for work on the Atári, Chunián and Pakhoki rájbahás from the Katora Canal, and which were commenced in October 1874.

Original Works,  
Ordinary.

306. The regulator at Khudián was completed. Also a branch head for the Pakhoki out of the Chunián rájbahá, and a tail fall to it, completing this rájbahá, the earth-work of which was finished last year.

Masonry Works.

307. Tail falls to the Atári and Chunián rájbahás remain to be built, and a bridge on the Chunián and Kanganpur road.

308. About one-half the work on these has been completed.

Timber bridges.

309. 2,891,370 cubic feet earth-work was executed, completing the earth-work of the Atári and Chunián rájbahás.

Earth-work.

310. The Budget allotment for these rájbahás having been expended, the work was stopped in September. Of a further allotment sanctioned in March, only a small portion could be expended on account of the unusually large rabbi crops which had to be gathered.

Cause of delay in  
completing rájba-  
hás.

## IRRIGATION.

Damage done by floods. 311. In August great damage was done to the rájbahás by the heavy floods which came down in that month. Their banks were swept away in many places, and the pier supporting the two regulating gates of the Chunián rájbaha head at Khudián was overthrown.

Masonry repairs. 312. The stop-dam at Dhapai, on the Khánwah Canal, damaged by the floods, was repaired, and the walls raised. The bridges at Hujra, Dipálpur and Kacha-Pacca, on this canal, were also repaired.

Timber bridges and chaukís. 313. Petty repairs to timber-bridge and canal chaukís were executed.

Canal bed and banks. 314. Walls were built near the heads of the Khánwah and Upper Sohag Canal to define the normal bed. The usual silt and jungle clearances, and repairs to banks, were executed.

Protecting river bank. 315. The left bank of the river was being cut into by the Sutlej a little above the Khánwah Canal head ; a tree-spur was therefore put in in order to protect it. It was found necessary afterwards to put in another a little higher up. This bank will have to be looked after and protected if the river does not form a new channel for itself during the next floods.

Discharge of river Sutlej. 316. The usual observations of minimum discharge of the Sutlej were taken. The results obtained were as follow :—

On the 20th December 1875, 9819 cubic feet per second.  
On the 14th January 1876, 9466       "       "

## SPECIAL SURVEY DIVISION.

Special Survey Division. 317. The whole expenditure in this Division was "Ordinary."

Employment of establishment. 318. The Survey establishment was employed as follows :—

Rechna Doáb. In the Rechna Doáb an area of 36 miles between the Bajwant and Chandra Bhaga nallahs was surveyed and map completed by Mr. McAtkinson, Assistant Engineer. The levels originally entered on the cross-sections of the Rechna Doáb were corrected in accordance with more trustworthy levels subsequently obtained of starting points.

Sidnai Canal Project. Lieutenant Mascall, R. E., and Mr. Hanna, Executive Engineers, Supervisor Kapúr Singh, and Sub-Overseer Firozdín, were employed on the Sidnai Canal Project, under the direct orders of Mr. E. C. Palmer, Officiating Superintending Engineer.

## IRRIGATION.

319. A survey of the River Sutlej between the villages of Khajiki and Púran, and some trial lines for distributaries required to complete the surveys of 1874-75, were finished. During the hot weather most of the establishment was employed on the Lower Sohág and Pára Project.

Lower Sohág and  
Pára Project.

320. From the commencement of the cold weather the whole of the establishment was employed in completing the cross-sections of the lower part of the Bári Doáb from Chunián to the end of it. Two main lines of levels were run down the Doáb, the upper along the Lahore and Mooltan Railway, and the lower along the Sutlej.

Lower Bári Doáb  
Surveys.

321. These were checked by being closed on Great Trigonometrical Survey bench-marks, and the error found to be about 0.50' per 100 miles. A very reliable set of bench-marks was thus obtained along these lines, and cross-sections at a distance of about 4 miles apart were then run from one to the other.

322. For the cross-sections across the high land of the Montgomery District, bench-marks on lines of levels, the one by Mr. Simon, Executive Engineer, and Supervisor Kapúr Singh, taken in 1872, and the other by Major Swinton, R. E., were used as points to connect. The error in the former was 0.22', and in the latter 0.40' per 100 miles only.

## DERAJAT CIRCLE.

323. The following are extracts from Mr. H. Garbett's report :—

## DERA GHAZI KHAN DIVISION, INDUS INUNDATION CANALS.

324. The Indus throughout the year was at a much lower level than usual; the floods were not so severe, and the irrigation fell off by about 3200 acres.

General.

325. The Government of India sanctioned the purchase of *Abdul Rahím Khán's* Canal at a cost of Rs 33,338.

Purchase of Abdul  
Rahím Khán's  
Canal.

326. Additions were made to the embankments at *Kot Dáúd*, *Bahár Sháh* and *Sháh Jamál*; about 110 lakhs of cubic feet of earth-work were dug out. Portions of the *Káláh* and *Sháh Jamál* embankments were carried away as anticipated, but the retired lines which had been made shut out the floods successfully.

Protective embank-  
ments.

## IRRIGATION.

## Regulators.

327. The regulators of the *Kastiri*, *Khán Díván* and *Keria Kaháwar* Canals were commenced ; but, owing to difficulties in getting in the foundations caused by the height of the spring-level were not finished during the year.

## Silt clearance.

328. About 236 lakhs of cubic feet of silt-clearance were executed during the year on the various canals.

## Erosion of river banks.

329. The erosion of the banks of River Indus affected the heads of the *Mánka*, *Kot Dáúd*, *Shoria* and *Dhúndi* Canals, and the creek, which supplied the *Chibri*, silted up. New supply-channels were required for the *Mánka*, *Chibri* and *Dhúndi* Canals. The other canals worked fairly, though the river was so much lower than usual.

## Remedial measures.

330. Efforts were for the first time made this year to arrest the river erosion, and to divert the main current at the points threatened ; those made when the river was high during the inundation season either failed or were only partially successful. The works subsequently undertaken, though commenced when the river had begun to rise, have so far been completely successful, and the main stream has been diverted at a comparatively small cost at *Kharkwálah* and *Sháh Jamál*. Detailed reports of these works will be submitted at the close of the present season.

## Buildings.

331. Buildings were repaired at a cost of Rs. 1,300.

## Plantations.

332. Plantations were kept up at an expenditure of Rs. 4,500 ; 16,200 young trees were planted out, and the nurseries kept stocked.

## SPECIAL SURVEY DIVISION.

Muzaffargarh em-  
bankment.

333. This work forms a Sub-divisional charge in this Division, and is under an Officer of the Engineer establishment, with one Native Overseer and four Sub-Overseers ; the cost is at present borne by Provincial Funds.

## Earth-work.

334. The earth-work executed during the year under review was about 12½ lakhs of cubic feet.

Maintenance and Re-  
pairs.

335. Such repairs as were necessary to keep the bund in proper order during the floods were executed from time to time.

## Masonry works.

336. Six regulators, commenced in the year 1874-75, were completed in July 1875. Two more regulators were commenced in October 1875, but were stopped at the beginning of November. Work was again recommenced in January



## IRRIGATION.

1876, and preparations made for the manufacture of materials at sites of three more. Four were in a forward state at the end of the official year.

Masonry works.

337. Four culverts were commenced in October, and completed before the close of the year, one more being in progress. Several small drains for passing the water from wells under the bund for irrigation purposes have been commenced, 12 having been completed at end of year.

338. The following table shows the length of levels and surveys executed during the year for extensions of the embankment which are now being considered by the Civil Officers, and for two small irrigation projects :—

Detail of field work.

Name of Project.	Levels.	Surveys.	Levels and surveys.
	<i>Miles.</i>	<i>Miles.</i>	<i>Miles.</i>
North bund extension ... ..	...	...	20
South ditto ... ..	16	30	...
„ ditto No. I. ..	34	150	127
„ ditto „ II. ..	...	31	392
Sanánwan Canal ... ..	...	...	192
Gúmal project ... ..	...	...	67
Total ... ..	50	211	798

339. The floods during the year were inconsiderable compared with those of 1874-75.

Floods.

340. The usual discharge observations of the Indus were taken ; but upon examination it appeared that there were errors in the calculations, which have necessitated the return of the papers to the Superintendent for correction. The results are therefore not recorded.

Discharge observations of the Indus.

## SIRHIND CANAL.

341. The following report by Major Home, R. E., Superintending Engineer, gives full detail of the progress made in 1875-76. It is considered to be satisfactory. In some parts the report has been somewhat abridged :—

## MAIN LINE DIVISION.

342. This may be said to comprise a report on the work of the Railway and Materials Division, which provided nearly all the materials used on the Main Line, and also brought them to the site of the works.

Collection of materials.

## IRRIGATION.

## Nálagarh Railway.

343. The Nálagarh Railway continued to work till the beginning of July, when the setting in of the rains and the flooding of the nallahs put an end to traffic both on it and also on the Main Line. The line worked well, and the deliveries of stone were regular up to the rains, so that, considering the late date at which the line was opened (beginning of March), there was a fair reserve of materials on hand to carry on work during the close season.

## Interruption to traffic.

344. Owing to delay in constructing some masonry culverts on the line, and to the considerable repairs which the action of the heavy rains on the new embankments and cuttings rendered necessary, the traffic was not resumed till the beginning of December, since which time it continued uninterruptedly till the close of the year.

## Main Line.

345. The Main Line has continued in very satisfactory order; the work of replacing chíl sleepers by deodár has been continued. The quarries at Ghamsole have been carefully worked.

## Labor.

346. An outbreak of cholera during the rains seriously affected the out-turn during the close season, and it was only with great difficulty that the necessary supply of labor was again obtained. Many of the contractors now working at the quarries are from *Delhi*, and are moneyed men, so that it is to be hoped that the supply of labor will not be again liable to such great fluctuations.

## Materials continued.

347. The stone continues to be satisfactory; but there is a great deal of rubbish and earth with it which has to be put to spoil on a rather limited area.

348. At *Pattarheri* no more kunkur has been brought to the surface; there has been a constant and sufficient supply to the works for lime-burning, and also for construction. The lime continues to give great satisfaction. The Keríthpur nallah continues to be worked for boulders, and, as the out-turn is good, it is proposed to continue operations there for yet another year. The stone is delivered at Rúpar at a low rate, and supplements the supply from the Ghamsole quarries. Some bricks and a large quantity of soorkhee have been burnt during the year. The arrangements for carriage by rail during the year have not been as satisfactory as could be desired; but it is expected that the changes which have been made in the Division will prevent a recurrence of the delays, &c., complained of. The manufacture of lime is carried out by the Officers of the Works Divisions at Rúpar and Kírri. The lime is treated

IRRIGATION.

Materials continued.

as a cement and pulverised by disintegrators worked by steam-power ; the supply has kept pace with the requirements of the works.

349. In December 1875, the Rúpar Workshops were attached to the Railway and Materials Division. They have been made more efficient by the addition of a small cupola, and have been kept in full work during the year.

350.	Length.	During year	Excavation, Main
1st Division	11 miles.	47,624,958 cubic feet.	Line.
2nd    ,,	28    ,,	20,883,532       ,,	

There is an increase in the quantity excavated in 1st Division, although the pit is deeper, the lead longer, and the spring-water more troublesome.

351. It may be further stated that the loco-incline in the first two miles stopped work in December 1875, having taken out the upper lift. The first mile is being bottomed out by manual labor, and the water is kept under by steam-pumps ; the incline will not again be set to work until the arrangements for draining the second mile (which are in hand) have been completed. In the 2nd Division the channel-excavation is complete, with the exception of the removal of some communication bunds, and the final clearance, which will not be made until the time for opening the canal approaches.

Diversion cuts and drains.

352. The surveys for the diversion-cuts in connection with the Budki superpassage and Duher syphon have been in hand during the year ; but neither system can be said to have been completely decided on. A drainage-cut in connection with a pumping station at the Rúpar nallah to get rid of spring-water in the 2nd and 3rd miles has been decided on, and the necessary plans and estimates were under preparation at the close of the year. The cuts and drains already open were kept in repair, and worked well. The ponded drainages on the left bank of the canal between Rúpur and Kirri (13th to 16th miles) were connected by cuts to equalize the level of their waters, and the work has proved a success. The Chamkaur escape-excavation is nearly complete.

Masonry works.  
Head works.

353. Considerable progress was made on the Head Works at Rúpar during the year. It was found quite feasible to get in the foundations to full depth with steam-pumps. At the close of the year the foundations of the wall between the regulator and lock-channel head were completed, and more than half the superstructure up to level of cornice. The foundations of the regulator were in ; the rubble masonry flooring completed ; and the block in course cover-

Regulator.

## IRRIGATION.

## Undersluices.

ing of cut stone nearly finished. The foundations of the weir undersluices were two-thirds finished, and about one-third of the rubble-flooring completed; the left hand flank wall was well in hand, being about four feet above plinth-level. On the right flank of the weir foundations had been excavated and partly built. An extraordinary flood in March topped an unfinished bund, and flooded the head works, retarding the works, but doing no damage to masonry or machinery.

## Siswán superpassage.

354. The foundation-pit of the Siswán superpassage was got out. A spring broke out in the pit through one of the old bore-holes; the sinking of a well to staunch the spring was still in progress at the close of the year.

## Chamkaur Regulator, &amp;c.

355. Stone and block kunkur was collected at Chamkaur regulator and escape sites during the latter part of the year.

## Harron syphon.

356. The Harron syphon was completed, and the floods of 1875 passed through it satisfactorily.

## Bridges.

357. Fair progress was made in building the *Katlaur*, *Belolpur*, *Kálka* road, and Grand Trunk Road bridges; those at *Rattipur*, *Garhi* and *Rámpur* were completed.

## Observations of discharge of the Sutlej.

358. The following are the results of observations made during the year :—

<i>Date.</i>	<i>Place.</i>	<i>Discharge.</i>
19th December 1875 ...	Búpar. ...	3961 c. ft. per sec.
19th December „ ...	Do. ...	3737 „ „
20th January 1876 ...	Do. ...	2304 „ „

The first result was obtained by using floats to ascertain surface-velocity; in the others the current meter was used.

## Plantations.

359. A considerable area of finished spoil was sown with tree-seeds; the existing plantations were kept in good order; and parts of the spoil, where previous sowings had failed, were resown with Kíkar and Sissu.

## Accounts.

360. The Accounts Division has been acknowledged on all sides to be a great success, and the new arrangement works without any friction.

## 3RD DIVISION.

## Collection of materials.

361. During the year—

Bricks, pacca	...	<i>Number</i>	9,662,000
Ditto for concrete	...	<i>Cubic feet</i>	166,300
Kunkur for lime	...	„	138,500
Fuel (wood)	...	„	8,026,320

were collected.

## IRRIGATION.

362. A Bull's circular flame-kiln was erected at the site of the 26th mile lock and fall, Abohar Branch. It has proved a great success. The size of kiln in use on 3rd Division gives an out-turn of 4 lakhs of bricks per mensem, and costs about Rs. 800 to build ; but it cannot be used satisfactorily unless sufficient fuel can be collected to allow of the operations being carried on continuously. Both ordinary flame-kilns (Allahabad pattern) and upla clamps are also in use in this Division. The kunkur lime is burnt with wood and charcoal, and makes a good mortar.

Bull's circular flame-kiln.

363. At the close of last official year only 10 miles of channel were in hand, and the progress was 8,300,000 cubic feet. During the present year the progress on the Combined Branches (2 miles) and Abohar Branch (50 miles) was 147,000,000 cubic feet, and the excavation of these lengths was practically completed.

Excavation of canal channel.

364. The permanent buildings on the Abohar Branch were completed during the year. The following works were commenced during the year :—

Masonry works.

*Lock and Fall at 5th Mile.*—Most of the concrete got in, and masonry in foundations commenced. Road-bridge at 8th mile completed.

*Lock and Fall, 10th Mile.*—Excavation of foundations in hand.

*Lock and Fall, 14th Mile.*— Ditto ditto.

*Lock and Fall, 21st Mile.*—Fall completed, bridge being arched ; lock about half finished.

*Lock and Fall, 26th Mile.*—Excavation of foundations in hand.

*Lock and Fall, 32nd Mile.*—Foundations excavated. Concrete and masonry of foundations in hand.

*Lock and Fall, 43rd Mile.*—Concrete all in. Masonry of cistern and crest-wall nearly finished.

*Bridge, 46th Mile.*—Ready to be arched.

365. The surveys for the alignment of Bhatinda Branch, (first 40 miles) were continued during the year. The tracing of the drainages was continued, and the area of cross-sectioning extended to the main drainages which bound the Doáb.

Surveys for new Projects.

366. The final alignment for the Sutlej navigation-channel was fixed, and the surveys for land-plans were well advanced at the close of the year.

## IRRIGATION.

Collection of materials.

## 5TH DIVISION.

367. During the year—

Bricks, pacca	...	...	Number	815,850
Ditto for concrete	...	...	Cubic feet	5,500
Kunkur for lime and Fuel (wood)...				

were collected.

Allahabad flame-kilns are being employed to a considerable extent in this Division wherever wood-fuel is procurable at fair prices. As stated in previous reports, there is always trouble in obtaining upla and other fuels in the Native States.

Excavation.

368. No channel-excavation was commenced. A bund was thrown up along the line of the feeder-channels with measured openings for the purpose of gauging the quantity of cross drainage which will have to be provided for.

Masonry works.

369. Temporary and permanent buildings on feeder-line in hand. Of these one 1st class inspection bungalow was about two-thirds finished; a second class bungalow about one-fourth finished, and another was commenced. The Executive Engineer's temporary quarters at Maler Kotla were finished, and the office ready for roofing. One Assistant Engineer's temporary quarters and one Overseer's were completed.

One Overseer's temporary quarters were commenced. Collection and manufacture of materials for the Kotla Branch Head, and for the syphon at the Sirhind nallah, were in progress.

Surveys for new Projects.

370. Thirty miles of the Kotla Branch were aligned, and the land-plans made out; some delay took place in further surveys to ascertain the possibility of diverting the large drainage crossed at the 30th mile, and it was satisfactorily settled that this could be done.

## 6TH DIVISION.

Collection of materials.

371. During the year—

6,034,894 bricks, pacca,
13,800 cubic feet of kunkur for lime,
Bricks for concrete and wood for fuel,

were collected.

Excavation of channel—Patiála navigation-channel.

372. On the Patiála navigation-channel and escape good progress was made, especially on the latter, which will be fully opened by the rains of 1876.

373. The spring-level is high (above bed) on part of the navigation-channel proper, and consequently the progress is not so rapid as could be wished, but it is about three-fourths finished.

IRRIGATION.

374. On the Choa Branch, excavation was commenced during the last quarter of the year, and was progressing favorably. Excavation of 2nd and 3rd feeders was well in hand, and was about half finished at the close of the year. Ground had been broken for the Patiala city improvement works, but not much progress made. These works are being carried out at the cost of the State by request of the late Maharájah.

Excavation of channel—Choa Branch.

375. The two bridges reported to be in hand last year on the Patiala navigation-channel escape were completed during the year. The fall at the tail of navigation-channel proper was nearly finished. The bridge at the north-west corner of Patiala city was above foundation-level, and that at the Sirhindi gate was finished, as also were three small bridges over the catch-watercut. On the Gaggar Branch, the regulator at head was ready to be arched, and the foundations of the fall at *Nedampur* were excavated. On the Choa Branch, some of the wells for foundations of regulator were built and ready for sinking. The regulator for 3rd feeder was ready for arching, and the bridge at *Rukra* was in the same state. Nearly all the permanent and temporary buildings on this Division are completed.

Masonry works.

376. Compensation was paid for land under the Gaggar Branch and Patiala navigation-channel.

Land compensation.

CHAPTER III.

REVENUE.

377. The aggregate expenditure during the year on all the works under the control of this Department was ~~Rs.~~ 35,67,014, of which Rs. 8,99,579 were contributed by Native States on account of the Sirhind Canal; Rs. 10,52,049 was spent on canals returning revenue; Rs. 16,15,386 on those under construction.

Total outlay on canals in the Punjab.

378. The total capital invested up to the end of the year has been—

Capital invested.

	Rs.
On canals in operation ... ..	2,02,37,518
Under construction ... ..	1,24,49,314
Mádhopur Workshops ... ..	5,84,928
	<hr/>
	3,32,71,760
Deduct contributions from Native States	41,80,088
	<hr/>
Capital invested by Government ...	2,90,91,672

In addition to the above, there is a debit against the canals of Rs. 78,848 on account of capitalized value of abatement of

## IRRIGATION.

- Capital invested.** land revenue on lands occupied by them, which has not yet been added to the capital ; this amount only represents the portion due on lands lately acquired ; the amount for previous operations has not yet been ascertained.
- Canal Revenue.** 379. The total income for canals under operation was Rs. 18,55,428 excluding, and Rs. 29,08,068 including, land revenue. The working expenses amounted to Rs. 12,46,255, so that the net revenue amounted to Rs. 6,09,173 excluding, and Rs. 16,61,813 including, the land revenue.
- Percentage of profit.** 380. The percentage of profit on the capital was thus 2·31 per cent. excluding, and 6·29 per cent. including, land revenue dependent on the canals. The percentages of the previous year were 3·26 and 7·56 respectively.
- Cause of falling-off in direct revenue.** 381. The falling-off in the direct revenue is due to the damage done by the extremely heavy rains of the year increasing the cost of repairs, on the weir at *Madhopur* alone an expenditure of Rs. 1,15,482 was incurred. The increase on total revenue is due to a revision of the amount credited as land revenue, both on the Western Jumna and Indus Canals, and includes on the latter a balance from the previous year in which an error had been made.
- Direct receipts.** 382. The direct receipts are in excess of those of the previous year, but slightly less than those of 1873-74 and 1872-73. I regret to say that the returns of 1876-77 will probably show a great falling-off, owing to the very heavy rain having enabled the cultivators in many parts of the country to do without canal-water. The area irrigated has fallen off from 1,208,073 acres in 1874-75 to about 1,098,500 in 1875-76.
- Working expenses.** 383. The working expenses, notwithstanding the heavy repairs, have only increased by Rs. 64,541, and in both years form about 66 per cent. of the direct receipts and 43 per cent. of the total receipts. It is expected that there will be an improvement under this head in the current year, as establishments are being much reduced.
- Percentage of Revenue on Capital.** 384. If only the canals in operation are considered, the excess of revenue, amounting to Rs. 6,09,173, would give a percentage of 3·08 on the capital. Those which do not pay the interest are the Bári Doáb Canal and Upper Sutlej Inundation Canals, neither of which are as yet completed.



## PART IV.—RAILWAYS.

### GUARANTEED RAILWAYS.

#### SCINDE, PUNJAB AND DELHI RAILWAY.

#### GUARANTEED.

385. The number of passengers has increased in all classes, clearly proving that the Railway is being more resorted to. On the Punjab Section, the 3rd class traffic shows a decided improvement, and, no doubt, this increase is due to the running of local trains to suit this class of passengers, and also to the reduction in the fares.

Increase in passenger traffic.

386. On the Scinde Section, the introduction of an intermediate class has proved a success. There has been a marked increase in the goods traffic on the Scinde line and Indus Flotilla, necessitating the running of extra trains on the Scinde Section, and the employment of native boats for the river traffic. The latter of course provides for the carriage of Indus Valley State Railway material.

Traffic on Scinde section.

387. The goods traffic on the Punjab and Delhi Section has slightly fallen off, but this may be attributed to the serious breaks which occurred on the line, owing to last year's heavy rain-fall and floods.

Decrease of goods traffic on Punjab and Delhi section.

388. The exceptionally heavy rain-fall last season and the unprecedented floods in August and September, caused much damage to the Railway line and works, and for a time stopped all goods traffic on the section between Jullundur and Lahore. Fortunately, the large bridges all stood well, and, by strenuous exertions on the part of the Railway staff, through communication was soon restored. Estimates for repairing the damaged works, and also for strengthening the existing, and affording increased, waterways on the line, have been laid before Government, and amount to Rs. 12,79,807. In this amount is included a sum of Rs. 1,80,852 for additional stone protection to the large bridges.

Rain damage repairs.

389. The erection of the oil-mill at Lahore has been completed; and the erection of the third line of telegraph between Lahore and Gháziabad is in progress.

Completion of oil-mill, &c.

390. Both the passenger and goods stock of the Company have been improved, so as to afford greater comfort to travellers and to carry increased weights, and the following

Passenger and goods stock.

## GUARANTEED.

Stock constructed for  
P. N. S. Railway.

vehicles have been constructed in the shops at Lahore for the  
Punjab Northern State Railway :—

First class carriages	...	...	...	3
Second class do.	...	...	...	2
Composite	...	...	...	2
Third class carriages	...	...	...	22
Carriage trucks	...	...	...	2
Powder-van	...	...	...	1
Covered goods wagons	...	...	...	20
High-sided wagons	...	...	...	10
Horse-boxes	...	...	...	2
Total	...	...	...	64

Experiments in trans-  
port of troops and  
war matériel by  
Railway.

391. Under the orders of the Government of India, a Committee of Military and Railway Officers assembled at Delhi during the Camp of Exercise there last cold season to prosecute experiments on an extended scale on both broad and narrow gauge railways in the embarking and disembarking of troops, &c., on and from railway trains. The results of the experiments then carried out have been laid before the Supreme Government, but have not as yet been made public. Alterations to certain wagons of the Scinde, Punjab and Delhi Railway to adapt them for military purposes have produced a vehicle generally considered well suited for the ready embarkation or disembarkation of guns, horses, &c., on the end loading system, so strongly advocated by Lieutenant-General Sir C. Reid.

Use of coal.

392. The use of coal as far as Lahore has considerably reduced the risk of fire from sparks, and consequent compensation claims, besides enabling better timing to be kept in the train service ; but it has not yet been found practicable to extend its use to Mooltan. On the Scinde Section coal also is used as fuel, and wood has been abandoned owing to the supposed injurious action on the engines of the wood-fuel.

Capital and Guar-  
anteed interest.

393. The Capital of the Company bearing interest is £11,079,640, and, after deducting the net profits for the year, viz., £243,685, from the interest payable under the guarantee, viz., £553,762, the result is a net loss to Government of £810,077.

Train service during  
visit of H. R. H. the  
Prince of Wales.

394. His Royal Highness the Prince of Wales travelled by special train on the Scinde, Punjab and Delhi Railway line from Gháziabad to Lahore in January 1876, and the train service was performed with safety and punctuality, and His Royal Highness expressed his satisfaction at the general arrangements.

## STATE RAILWAYS.

## STATE RAILWAYS.

## PUNJAB NORTHERN STATE RAILWAY.

*Part I.—Works of Construction on Capital Account.*

395. Almost immediately after the commencement of the year, the mètre gauge rail-road from Lahore to Wazirabad was open to the public for traffic. The works, therefore, on this section of the original line were then practically completed. Operations had not yet been commenced on the broad gauge line between Lahore and Wazirabad, and beyond the latter place a portion of the earth-work on six or seven miles only had been executed. Surveys for the new line, Lahore to Jhelum, were, however, closed, and nearly all the land had been taken up throughout. Beyond Wazirabad the position of works constructed under the previous, or mètre gauge line, sanction, but available also for broad gauge, was somewhat as follows :—

State of works at the close of year 1874-75.

396. Completed, ready for mètre gauge traffic.

Palku Bridge (9 spans of 12 mètres).

397. At the commencement of the year the overturned wells of September 1874 were being rapidly replaced, and the bridge required but 15 spans of its girders to complete the structure for light broad gauge requirements.

Chenab Bridge (64 spans of 40 mètre girders).

398. Brick-work to girder bed level finished, and the mètre gauge girders ready at site.

Bhimbar Bridge (20 spans of 12 mètres).

399. All the wells were sunk, ample boulder protection given, and pier superstructure completed; girders were at site, but under orders of Government the work of erecting them was in abeyance.

Jhelum Bridge (50 spans of 90 feet).

400. All the other numerous works in bridges and viaducts on the trunk road between Wazirabad and Jhelum, with the exception only of the cuttings and embankments and their connected masonry structures in the Khárian Pass between mile 92 and mile 100, not partially available for the new line, and which were then ready for the mètre gauge permanent-way, had to be abandoned and constructed *de novo* under the new broad gauge estimates submitted to Government on the 9th March 1875.

State of works between Wazirabad and Jhelum.

401. The progress during the year has been, it will be seen, effective, although the money outlay is less than in previous years. The state of affairs now is generally as follows :—

Summary of the year's results.

The altered Chenab, Palku and Bhimbar, along with many other new bridges on the 40 miles between Wazirabad and

## STATE.

## Summary of the year's results.

the Jhelum south bank, have been completed, and the mètre gauge extension on the broad gauge bank, and bridge and station works passed for public opening by the Consulting Engineer to the Government of India (opened 10th April). The 50 Jhelum bridge girders are all in place on the piers, and their repair, strengthening and rivetting up for the broad gauge road is making active and rapid progress. The earth-work of the new embankment, Lahore to Wazirabad, is finished, and the numerous viaducts, culverts, stations, &c., on the same length, are so well in hand as to assure the completion of the new line from Lahore to Jhelum throughout in about another year. The mètre gauge railway has been provided with rolling-stock, and thoroughly equipped for traffic on a length of 102 miles. The new surveys on the three Executive Divisions between Jhelum and Attock have made successful progress, and the field-work for construction between the former point and Ráwalpindi, on an approved location, been completed. During the year there have been at the same time exceptionally heavy floods, and much consequent interference with progress, both on the works themselves and by the necessary revision of designs, rendering the results attained still more marked and satisfactory.

Detail of work executed:—  
Alexandra Bridge.

402. In particularizing the works of the year under review, the first in importance is the Chenab bridge. This structure, by the special permission of his Royal Highness the Prince of Wales, received, on the 23rd of January 1876, the name of "Alexandra" in honor of the Princess of Wales, and was then opened by His Royal Highness in person. The wells of three new piers, 46, 47 and 48, replacing those lost in September 1874, were bottomed early in May 1875, and then left, each protected during the summer floods by a quantity of 30,000 cubic feet of concrète blocks. By October the brick-work of these piers was finished, and in two months all the remaining girders, inclusive of the new pair of 154 feet span, of which the supply from England was rendered necessary by the position of the fallen wells, were in place, and a continuous road established between Wazirabad and Kathála. The state of the river-bed after the close of the rains greatly facilitated this expeditious progress. Had the sidelong set of the main current parallel to the piers, productive of so much mischief during the previous flood season, continued, it would have rendered the erection of all these spans tedious and costly. Fortunately the effect of the previous cold season's operations in cutting away the north-west corner, and channelling through the centre of the great "chur" island above the bridge site,

## STATE.

proved to be precisely that anticipated, and resulted in the straightening of the flow of the stream, and the formation of a sand-bank on which operations were easily carried out. The works of this bridge were commenced in November 1871, and the first train passed over it on the 23rd of December 1875.

Alexandra Bridge.

403. Defects in the ends of many of the diagonal bars of the Jhelum bridge girders having led to doubts as to the quality of the iron—and this and other considerations, also as to the expediency of the use of these girders for the line with its altered gauge—progress in the erection of this bridge has been arrested for the greater part of the year. Careful tests having been, however, made,—first of the quality of the iron, and afterwards, early in December last, of the sufficiency of the girder beam, by the imposition of twice its maximum load on the span fixed in place, and resulted in satisfactorily establishing both the excellent character of the metal and the full efficiency of the design and workmanship—it was decided that the work should proceed. To guarantee the joints in booms against the flaws detected, or possible, in the diagonal bars, it was settled that all of them should be fitted with strong external and internal cover-plates. This, while most efficiently completing the structure, adds immensely to the already very heavy work implied in putting these girders together, complicated as this further is by the numerous details of adaptation to broad gauge requirements.

Jhelum Bridge.

404. Although little more than three months have elapsed since the orders of Government permitted the resumption of operations, and the large quantities of additional iron required have been obtained with much difficulty, the end of the year finds all the 50 spans of this bridge in place, and a substantial advance made with the heavy details of fitting and fixing. No interruption is now to be apprehended from the river floods, and all is going forward in a manner which justifies the expectation of our being able to take the traffic across the river into Jhelum early in September next.

405. The training works on the River Ravi were subjected to a very severe test in August last, and were then breached between the Mahmúd Buti head works and Shalamár, and also near the bridge itself at Khokhar. These damages are being made good prior to the coming flood season. Although under a recurrence of similar circumstances like partial disasters may be expected, these circumstances are of so rare an occurrence that any special provision against them, necessarily as it must be of a very costly character, does not seem to be expedient. The system in use, notwithstanding

River Training Works.

## STATE.

**River Training Works.** the experience of the year, appears to be the best that can be adopted at a reasonable cost, although it will be indispensable to supplement it from time to time by additional groins and tree-spurs.

406. The similar works executed on the Chenab and Jhelum have stood, and most successfully realized their purpose in both these river-beds. All that seems necessary with the former is to give them something of the permanent character already attained in the latter by the facilities which the shingle from the stream-course and neighbourhood afford. The maintenance cost of the purely temporary works on the Chenab is very high, and the risks and trouble connected with them very great. On the other hand, any facing with shingle, or with concrete blocks and shingle, which alone seems to be a practicable means of giving them a permanent character, would involve a heavy immediate expenditure.

**Protective provision for large Bridges.**

407. The abutment and pier protection of the three large bridges has been amply maintained during the year.

**Ravi Bridge.**

408. At the *Ravi Bridge* the total quantity of block protection deposited to end of March 1876 was 934,653 cubic feet, of which quantity 77,061 cubic feet had been put in place during the year.

**Alexandra Bridge.**

409. At the *Alexandra Bridge* there were 2,296,807 cubic feet in place, and 47,659 cubic feet in reserve. Of the former quantity, 1,013,063 cubic feet has been deposited during the year.

410. At many of the piers the sanctioned quantity of 30,000 cubic feet has been largely exceeded, some of them having already swallowed up as much as from 40 to 45,000 feet in bringing the mass of this armour up to the prescribed height at date of opening the bridge. For this, as for the other two large bridges, where the circumstances are similar, though less marked, the Engineer-in-Chief has therefore recommended an increase of one-third more of the total existing provision. Excellent boulder material of large size and weight is now being obtained from the bed of the Jhelum, and on the Rhatian Hills at about mile 109 of the trunk road, and will be brought down by train to Kathála for the remainder of the supply in substitution of the concrete and brick-work cubes hitherto used.

**Jhelum Bridge.**

411. At the *Jhelum Bridge* the total quantity laid down is 667,389 cubic feet, of which 167,093 cubic feet is the season's deposit.

## STATE.

Bhimbar and Palku  
Bridges.

412. To adapt the Bhimbar bridge for broad gauge purposes, it has been necessary during the past working season to dismantle and rebuild the whole of the superstructure of the piers from low water level of foundation cylinders. The girders, like those of the similar Palku 40-mètre girder bridge, have also been strengthened for the heavy broad gauge.

Extension of the temporary  
mètre gauge line to Jhelum.

413. To permit the immediate extension of the temporary mètre gauge railway between Kathála (north bank of Chenab) and Naurangabad (south bank of Jhelum), the Engineer-in-Chief had arranged immediately prior to the opening of the year to carry out at once all the works of construction required for the broad gauge line. These have been accordingly executed during the year. In widening the cuttings and embankments through the Khárián Pass, mile 92 to mile 98, the amount of earth-work done amounts to 8,226,738 cubic feet. To the numerous culverts on this distance much has had to be done in raising parapet walls and wings, &c.; and some miles of masonry side drains have been constructed to carry off the heavy rain-fall drainage. Besides detail alterations or additions to existing works, there have been built on the 25 miles between Khárián and Kathála numerous small bridges and viaducts varying in span from 3 feet to 30 feet, and giving a total waterway of 3749 feet. Of this total length 891 feet run are of openings with brick substructure and iron tops, and 1680 feet run constructed with the flood gap material originally provided for the passage of the Ravi *khádír* land, which carries the roadway on either screw piles or columns with concrete bases; along with these are some thirty masonry irrigation ducts.

414. The laying of the permanent-way in mètre gauge material was commenced in October, and was ready for inspection by the Consulting Engineer on the 28th of March. It would have been got through more promptly, but was delayed for two viaducts near Khárián, mile 90, of which the brick and other materials had to be trained from Naurangabad and Kathála. As the broad gauge sleepers are in place for the present road, the laying on them of the 60 lbs. per yard rails will be effected without any interruption to traffic, and is alone wanted to make the broad gauge line continuous to Jhelum so soon as the completion of the works to Wazirabad permits.

## Station Buildings, &amp;c.

415. All the station buildings, platforms, engine-tank houses and wells, houses for open line staff and gate-keepers, &c., &c., have been constructed during the season suitably for broad gauge purposes, the localities provided for being Gujráat,

## STATE.

Station Buildings, &amp;c.

**Lála Músa and Khárián.** At Naurangabad a temporary station only has been erected, as this accommodation will cease to be needed when the Jhelum bridge is opened, except in so far only as it may be made available for the ferry passage of the bridge by ordinary local traffic in substitution of the bridge of boats.

Ballasting, and fencing in of line.

416. The road has been ballasted in excess of present requirements for the time only, and is fenced in on both sides by ditch and mound, with an adequate provision in level crossings. A new line of telegraph is being provided, the stations being meanwhile connected with the existing wires on the trunk road. With but little previously found done, all these works on 40 miles have been carried out and completed during the twelve months under report, and both the rapidity and character of the execution are eminently creditable to the Executive Engineers of the Chenab and Jhelum Divisions.

*New 5' 6" Gauge Line from Lahore to Wazirabad.*

Diversion of G. T. Road at Stations of Gujranwála and Wazirabad.

417. Although the removal of the Railway from immediate proximity to the Grand Trunk Road is one of the main objects to be attained by the new line, it was nevertheless considered desirable to utilize the works already constructed at the second class stations of Gujranwála and Wazirabad. To do this the trunk road required to be diverted at these towns. These diversions were therefore immediately put in hand, and were completed early in the year.

Progress made with new embankment.

418. The earth-work on these 62 miles was pushed on early in the year, in order that the full benefit of the season's rains might be obtained, and is now practically finished.

*Cubic feet.*

The quantity executed in the banks between Lahore & Gujranwála is	33,731,000
Do. Gujranwála and Wazirabad ... ..	7,525,000
Do. Wazirabad to South Bank Chenab ... ..	2,083,000
Do. in road diversions on the whole length ... ..	1,369,032

State of Masonry Works.

419. The masonry on the Ravi Division (mile 0 to mile 42) has progressed fairly, most of the founds being in place. Brick-making is up to time, and the collection of other materials satisfactory. Good working arrangements generally have been organized, and the time spent in a fair start will tell finally in more rapid results.

Exceptional floods in July and August clearly indicated extent of waterway required.

420. The whole distance between Lahore and Wazirabad suffered severely from the exceptional floods in July and August, but the experience gained of the flow and action of these floods has been invaluable in indicating much more clearly than before the proper extent and position of the large waterways required. A complete revision of the bridging has been therefore made throughout, with a good assurance that the engineering difficulties involved are now permanently overcome,



and that the railway works will be placed beyond the risk of serious contingencies from these causes. Between Gujranwála and Wazirabad all masonry in the flood-gap viaducts and small bridges is nearly ready for the girder superstructure. The station works are well advanced, platform walls, booking offices, tanks, wells, ash-pits, &c., being already in a state which places beyond any doubt their completion before they are likely to be required.

421. Of Ballast for the 62 miles, there has been collected and deposited at site up to date about 850,000 cubic feet.

422. Permanent-way of the 60 lbs. section is arriving from England, and is being deposited along the line. The first consignments reached Lahore in July, and up to date 52,089 rails, with proportionate fastenings, are on the ground.

423. At Wazirabad Station the building provisionally erected to serve for an engine-shed while that station was terminal is now being reconverted to goods purposes as originally designed. Additional platform provision is also being made for the considerable timber traffic which is developing itself there.

424. The field-work, which was still in progress for a new line between Jhelum and Ráwalpindi at the commencement of the period under review, was soon afterwards completed, and a preliminary project prepared during the summer was submitted to Government in September. The acceptance of this preliminary project by Government was duly notified in calling for certain deviations, in the location at the lower end of the line, suggested by the Consulting Engineer, and other revisions and improvements recommended by the Engineer-in-Chief. Subsequently, Sir Andrew Clarke, on a personal inspection of the railway works, desired a re-investigation of the Ráwalpindi Station approach line and terminal arrangements, with a view to realizing the advantages of protection from the fort on the one hand, and of increased traffic by greater proximity to the native city on the other.

425. Fresh surveys were made in conformity with these orders of Government, and the improved route which resulted from them, after having been inspected by Mr. Molesworth in December last and very favorably reported on by him, was finally adopted. The work of permanently staking out, preparing land plans, and collecting all the field data for a final project, has been subsequently going on, and was well advanced on both the Bakrála and Sohan Divisions at the end of March.

426. It was then expected that the staff would be able to take to summer quarters early in May, and devote themselves to the elaboration of the plans and estimates, &c., required for sanction and construction.

#### STATE.

Station works well advanced towards completion.

Ballasting.

Permanent-way material.

Works at Wazirabad Station.

Surveys for extension from Jhelum to Ráwalpindi.

Re-investigation of Ráwalpindi Station approach line directed by Govt.

Improved route adopted and line staked out.

## STATE.

## Ráwalpindi Station.

427. The investigation desiderated by the Member of Council for Public Works has been made and reported on, and still lies for consideration with Government.

## Surveys, Ráwalpindi to Attock.

428. Between Ráwalpindi and Attock, an efficient staff under Captain Gracey, R. E., has been employed during the last three months of the year in levelling over and mapping different trial routes for a further extension of the line selected for this purpose on the ground by the Consulting Engineer to Government for State Railways and the Engineer-in-Chief in December last. The progress on this work has been very satisfactory both in its rapidity and good results. These results will be submitted for the orders of Government as soon as the termination of the field-work permits the staff to take up the plotting and other office work essential to their report.

## Grand Trunk Road, Lahore to Jhelum.

429. The 102 miles of the trunk road between Lahore and Jhelum, less the three river-crossings and the Lahore Division, has been maintained in good order during the year by the Railway staff with an expenditure of Rs 1,30,526, including the cost of supervision by Railway establishment. Several extensive diversions, to some of which reference has been already made, required for its due separation from the railway track, have been undertaken, and are all nearly completed. These have chiefly been at Gujranwála and Wazirabad Stations, at the crossing of the River Bhimbar, and for a length of 4300 feet at Khurrialá, mile 97½.

## Retransfer of road between Wazirabad and Jhelum to Provincial P. W. Establishment recommended.

430. It has been recommended by the Engineer-in-Chief to Government that, as the length of the road between Wazirabad and Jhelum now no longer affects nor is affected by the Railway or its works, it should again fall under the control and charge of the Provincial Public Works establishment.

## Maintenance Works on open Line.

431. The works on the open line, Lahore to Wazirabad, have been efficiently maintained, save for some days during the high floods in August, at a time when an almost universal interruption to traffic took place in this part of India. Various additions and improvements have been made, involving capital outlay, such as a large increase to the rolling-stock of the line, goods and passenger sidings at Lahore, the construction of a mud wall fence throughout between the rail track and the trunk road, alterations to rolling-stock necessitated by the unexpected or augmented requirements of the traffic, and other minor matters. All that specially relates to revenue and the working of the open line is dealt with in the second part of this report.

432. An expenditure of 37 lakhs of rupees was budgetted for at the beginning of the year, but the Government of India raised this sum to 42 lakhs by an extra provision for earth-work in the new 5' 6" gauge line. The actual expenditure in January 1876 having, however, shown that this figure would not be reached, the grant was reduced from 42 to 37½ lakhs (25½ lakhs Indian expenditure, and 12 lakhs English). Until the accounts of the year are closed, the actual expenditure cannot be accurately known, but it appears from present information that only about 33½ lakhs of rupees has been spent altogether, being about 4½ lakhs less than the estimate. Until the amount of payments in England is known, it cannot be ascertained whether this shortcoming is the result of Indian or Home transactions. The expenditure of the year as above shown includes a payment of ~~Rs~~ 2,81,370 to the Great Southern of India Railway for 9 engines, 4 brakes, and 119 goods wagons 5' 6" gauge, purchased for use on the new broad gauge line of this Railway.

STATE.  
Expenditure compared with Budget.

*Part II.—Open Line, Lahore to Wazirabad.*

TRAFFIC DEPARTMENT.

433. For the first six months from the opening of the line, or from April 12th till October, one daily mixed train only was run at a speed of 10 miles an hour. The traffic had, however, meanwhile so steadily increased that at the latter date a second up and down train was added, and as the fence between the rail and the trunk road was then completed throughout, the speed between stations was augmented to 15 miles an hour. A permanent increase in the receipts of 50% from that date has justified this measure.

Number of Trains increased to meet the traffic.

434. Much inconvenience was caused during the earlier part of the official year by the insufficiency of the rolling-stock, and it was not till February that the completion of all the vehicles constructed for us by the Sindh, Punjab and Delhi Railway Company, and the arrival of more engines, put the line in the position of being equal to the demands on its resources.

Insufficiency of the Rolling-stock at commencement.

435. At the close of the year, the coaching receipts amounted to ~~Rs~~ 1,44,940, and the number of passengers carried was 379,676. As this gives an average of over 1000 passengers per diem, requiring something like 50 vehicles, the difficulties referred to with a speed of 10 miles an hour only will be easily understood. It was only for some time by carrying 3rd class passengers in goods wagons that the traffic could be met at all.

Receipts from passenger traffic.

## STATE.

Endeavour to make  
the Railway popular.

436. Every effort is made to foster the traffic, and commend the railway to the favor of the native public, and various steps have been taken with a view to provide for their comfort and convenience. Among these may be mentioned the setting apart of special carriages for women travelling alone; facilities for the reserve of single compartments for "*pardah nashins*;" the allotment of a second class compartment in all trains for the use of native gentlemen who may dislike being mixed up with Europeans, and would otherwise take 3rd class tickets; and the prevention of overcrowding by the posting up in each 3rd class carriage of notices of their carrying capacity, as well as the rigorous checking of all rough usage or incivility on the part of the Station staff and servants. All these measures have acted with marked advantage.

Arrangements for  
local traffic at  
large fairs.

437. Due attention is also given to special arrangements for local *melés* and fairs, of which there are annually, as at Dhaunkal near Wazirabad, one or more of considerable importance on the length of line itself, as also for the pick-up and deposit of travellers at crossings near the larger villages. The effects on receipts which these popular arrangements give will be increased as they become better known, and circulation is now being given to them by vernacular notices and hand bills.

Compensation claims.

438. All compensation claims are promptly settled, and all complaints carefully investigated, free access being encouraged to the Assistant Traffic Superintendent, of whose inspection visits to all stations due notice is given to the merchants of the adjoining cities.

Publication of Rail-  
way Time and  
Fare tables, &c.

439. Time and Fare Tables printed in the vernacular are posted at all stations, and they, as well as the local rules and fares for principal staples, are circulated through the District Civil Officers, as well as otherwise distributed in traffic centres. The Station staff are provided with uniform, so that there can be no difficulty in their recognition by either Europeans or natives. Hindu and Mussalmán water-carriers are employed at every halting place, where also free access is allowed to sweetmeat vendors, whose goods are subjected to periodical test, both in quality and cost.

Arrangements for  
Postal and Police  
services.

440. An adaptation of 3rd class carriages has been made, by which both Police and Postal requirements are met; one central compartment serving for the sorting of the mails, and the two ends for the safe conveyance of prisoners.

## STATE.

## Goods Traffic.

441. The goods earnings have been little more than half those from passengers, and the amount of the export trade again is in the proportion of 2 to 3 to that of the import. This is, however, only what might be expected from the non-manufacturing and purely agricultural character of the districts traversed, but is at the same time to a large extent also due to the fact of the line for the twelve months under review stopping short on the south bank of the River Chenab. The opening of the Alexandra Bridge is now producing a very marked effect on the carriage of goods, both up and down country, and on the passage of the Jhelum being similarly realized, the favorable results will be still more conspicuous. Not only will the tonnage per mile of the present staples be found largely augmented for the year on which we have now entered, but these will be added to by others in which there has been hitherto little or no business done on the line. These staples have hitherto been chiefly food grains, piece-goods, coarse woollen stuffs, oils, ghi, fresh and dried fruits, sugar, wines, spirits, and railway materials. To them are now being added timber to a large extent on the Chenab, and salt from the Mayo Mines at two stations between Wazirabad and Khárián. Both of these sources of traffic will take a leading place in the returns when the supplies on the River Jhelum of the former, and the facilities of Jhelum station for the latter, have been secured to the Railway.

442. In so far as the timber from Wazirabad is concerned, better arrangements in platforms and tackle for loading are expected to secure the whole of this conveyance, of which we have hitherto been able to take a portion only.

Better arrangements  
for Timber at  
Wazirabad Station.

443. The number of maunds of goods carried has been 1,329,530, and the receipts, Rs 81,250. In this weight, it should be noted, however, is included that of the permanent-way materials for new broad gauge line, and also that of the through goods from the Sindh, Punjab and Delhi Railway, the distribution of receipts being as follows :—

Weight and Receipts  
of Goods.

1st, 2nd, and 3rd class goods, with demurrage	...	Rs	52,019
Railway materials	...	"	29,231
		"	81,250

Through booking was established in May last, and to the 31st of March the traffic interchange in maunds was :—

Inwards	...	60,777
Outwards	...	45,280
Total	...	1,06,057

and receipts, Rs 18,057.

## STATE.

## Railway Material.

444. In regard to the amount realized for the transport of railway material, it should be also noted that the amount represents more or less nearly the actual cost of conveyance only, the rates adopted for it having had for basis, that while the revenue of the line should suffer no loss, it should not profit at the cost of construction.

## Railway Ferry at the large Bridges.

445. Some considerable addition is, I consider, likely to accrue to the traffic of the line, Lahore to Jhelum, by a system of railway ferry for the ordinary road-traffic over the two large bridges, Chenab and Jhelum, of which I am now making an experimental trial between Wazirabad and Gujrat for the former river ; several cattle-trucks are being adapted with open ends so as to allow a train of bullock carts with the cattle to be run in, without transhipment of load, from special ramps at one of their extremities, and run out at the other. Should this measure be found to answer, the number of these vehicles can be increased to meet requirements by the similar conversion of all our cattle-trucks, the truck remaining at the same time equally serviceable for all other ordinary transport. Artillery, if necessary, could be similarly run over. Not only, it will be observed, should we in this way absorb or suffice for the whole road traffic, but at the same time solve the troublesome question of the double use of these large bridges.

## Telegraph.

446. Receipts from this source for the year have been Rs. 2,833, but with three of the line offices only open. As all the offices have now been recently opened, it is fully expected that the earnings will soon at least prove equal to the interest on cost of construction, plus the cost of maintenance and working, and that the Railway will then benefit by the free use of the wires for its own purposes. The lines have worked satisfactorily, and the interruptions have been few.

## No accidents of moment.

447. No accident of a serious nature has occurred on the line during the twelve months, although the line is fenced but on one side, and since October last only, and had previously no protection against cattle on either side. The public have been carried to the number already shown without any injury to life or limb. Fires from the wood-sparks of the locomotives have been frequent, but not so far of much moment. As in the case of the covered goods stock, the interstices of the roof corrugations were found to admit the sparks, this defect is being remedied throughout these vehicles by affixing strips of zinc screwed on internally.

## Goods Stock altered to avoid fires from wood-sparks of Engines.

## Summary of Traffic results.

448. A summary of the traffic results for the 11 months and 20 days ending March 31st shows a total receipt of Rs. 2,30,098, or Rs. 2.99 per mile ; the train mileage being 76,881 miles, and the expenses, Rs. 26,720, or Rs. 11.61 per cent. on the earnings.

## STATE.

449. The result in this proportion of working expenditure to returns compares exceptionally well with other Indian Railways.

Summary of Traffic results.

450. Much difficulty has been found in providing the Station staff. The standard of education among the class from which these employes must be drawn is much lower in the Punjab than that prevailing in the lower provinces, and the number of Punjabis fit to be entertained at all is therefore small. For the larger proportion of the men entertained, we are dependent on rejections from the Guaranteed Railways, the higher salaries paid on which secure the selection of the best men. Not only is there therefore difficulty in obtaining men at all, but, as a rule, there is afterwards much and constant trouble in their management throughout. The credit which is due to the Assistant Traffic Superintendent, Mr. Keene, for his energetic, able, and very successful working of his Department in all respects is, I consider, much enhanced by this consideration.

Difficulty in providing Station Staff.

## LOCOMOTIVE DEPARTMENT.

451. The following table shows the rolling-stock in engines, carriages and wagons for the metre gauge line as it stood at the date of opening the section for public traffic, and at the close of the year 1875-76 :—

Rolling-stock.

Description of Rolling-stock.	On hand on 1st May 1875.*	On hand on 31st March 1876.	REMARKS.
Locomotive engines, Class A. ...	1	4	* The line was opened for public traffic on 12th April 1875, but no vehicles were received during April. † One of these fitted up as a prisoners' van.
Do. do. Class B. ...	7	7	
Do. do. Class C. ...	...	...	
First Class carriages ...	1	4	
Second do. ...	2	4	
Composite (first and second Class) carriages ...	2	4	
Third Class carriages without brakes	21	39†	
Third Class carriages with brakes ...	...	4	
Horse Boxes ...	...	3	
Carriage trucks ...	...	3	
Luggage or road vans ...	...	4	
Passenger brake-vans with Postal Compartment ...	3	6	
Covered goods wagons (Teak) ...	30	66	
High-sided goods wagons (do) ...	5	14	
Low-sided do. do. (do) ...	20	20	
Powder-vans ...	...	1	
Timber trucks ...	...	2	
Temporary low-sided wagons made up with the iron of covered goods wagons ...	79	78	
Engineer's ballast and way and works wagons ...	57	47	
Total ...	228	310	

## STATE.

## Rolling-stock.

452. This list, it will be observed, includes the vehicles which were still at the close of the year employed on the unopened line for construction purposes, and which have since that date, with the addition of the 40 miles between Wazirabad and Naurangabad, passed over to the charge of the Assistant Locomotive Superintendent.

## Economy of Engine-power.

453. The economical working of the engine-power has been materially affected by two causes—first, by the fuel, and secondly, by the position of the railway on the trunk road.

## Consumption of wood-fuel and growing scarcity.

454. The fuel used is all wood, chiefly Kikar and Jand. At the outset there was a well seasoned supply on hand, which lasted till about the close of December 1875, and gave, so far as the accounts kept can be relied on, a consumption of 54·16 lbs. per train mile only. The supplies which have been subsequently got have become, with the greatly increasing traffic, rapidly insufficient in permitting any accumulation for dryage, and it is now, despite every effort to the contrary, being so literally used from hand to mouth that the faggots sometimes go into the fire-box with leaves on them. The consequence is, that for the 29,173 miles run during the last three months of the year (January, February and March), 29,000 maunds of wood have been burned, giving a close approximation to 80 lbs. per train mile.

## Difficulty of having a reserve of fuel.

455. I have endeavoured to gain on the actual consumption, and form a standing reserve for six months' use; but between the augmented train work and consequent consumption on the one hand, and the constantly increasing scarcity of timber all over the surrounding districts on the other, there is very little prospect of success. This whole state of matters seems clearly to point, not only to the expediency, but equally to the necessity, more or less quickly approaching, of introducing coal for all traffic purposes.

## Use of coal expedient.

## Position of Railway on Trunk Road, and consequences.

456. To the position of the railway on the trunk road is due a largely augmented consumption of oil. The dust is excessive during the dry months, and frequently so dense that in a train of 20 vehicles the Drivers cannot see the brake-van. It is only, therefore, by a lavish expenditure of oil that the locomotive bearings and motion can be kept cool.

457. With the opening of the broad gauge line this drawback will, of course, cease to exist; but meanwhile, so long as it does exist, and a stock, either of dry fuel or coal, is wanting, no system of premia can be introduced to secure economy in either the consumption of oil or fuel.



458. Fortunately, with unavoidably high rates to cope with in both the above respects, the wages paid are moderate. Of the Drivers, one man only commenced on more than Rs. 100 per month, so that even with the yearly increments due at the close of the year their average pay on 31st March was Rs. 110 per month only. The overtime allowance of these men for the first six months after opening was Rs. 30 ; but, with the rapid growth of the work and the greatly increased running, it has now reached an average of 50 per cent. on their regular pay.

STATE.  
Wages of Drivers  
moderate.

459. The firemen, khalásís, lighters, &c., are all natives, and have been chiefly drawn from the Sindh, Punjab and Delhi line.

Employment of native  
firemen.

460. Now that the station wells have been brought thoroughly into use, the water is everywhere said to be excellent, the engines seldom or never priming, even if worked three or four days without washing out.

Character of water at  
Stations.

461. The locomotive repairs have been light, and within the estimated amount. The engines are washed out after each trip, and have one clear "shed" day for overhauling in every five, the average daily running per engine being 60 miles.

Repairs to Engines

462. The couplings between vehicles have been throughout the year a cause of difficulty and uneasiness, there having been fourteen cases of trains parting. After these repeated failures in the pattern originally received, an automatic modification upon it has been brought into use. This, although a very decided improvement, still fails in giving the degree of security required, and it has become now more than doubtful whether any further attempt to improve the one central connection will succeed in overcoming the existing difficulties, and in obviating the danger in running, more especially on the ghát inclines, caused by the different and varying height of the vehicles. All our experience here seems to show that safety side-chains will alone give reliable fastenings, and a proposal for their addition to all our stock is now under consideration.

Couplings of vehicles  
defective, and pro-  
posed modifications.

463. Another standing danger on this line at present is that of fire from wood-sparks. Although there have been hitherto only some half dozen averted cases of ignition to vehicles in motion, this immunity from more serious accidents of the kind cannot be counted on, all the more that the increased speed at which trains now run, and the long steep inclines of the Khárián Pass, considerably augment the liabilities both in their frequency and extent. The spark-arresters

Danger of fire from  
wood-sparks.

## STATE.

Danger of fire from  
wood-sparks.

are but little preventive, and the engines supplied to this line with their present funnels do not admit of the use of baffle plates. Every possible care and precaution is taken, but the most feasible and promising preventative to possibly serious casualties would seem to lie in the substitution of mineral for wood fuel.

## MAINTENANCE OF WAY AND WORKS.

Cost of maintenance.

464. If under this head the consequences of the July and August floods on the way and works to which I have referred in the construction part of this report be excluded from consideration, the results must be deemed satisfactory. The line and its connected buildings, and fixtures, signals, &c., having been maintained at a cost of ~~Rs~~ 35 per mile per month. With the exception of some additional sidings required in the Lahore yard for the increased traffic charged to Capital, no other has been laid since the opening. Six rails only have been removed throughout the 60 miles, and no sleepers.

Staff.

465. The Locomotive Department, and the Maintenance of Way and Works, form one charge only, which is entrusted to Mr. G. E. Thomas, Executive Engineer 4th Grade, to whose energy and zealous application are mainly to be attributed the good results attained in both branches during the past year.

466. Mr. Bruff, Executive Engineer in charge of the Open Line since December last, speaks in high terms of the valuable assistance he has received throughout the six months of his incumbency, both from this Officer and from Mr. Keene, his Assistant in the Traffic Department, and I entirely concur in his estimation of the good services of these Officers.

Train arrangements  
during visit of His  
Royal Highness the  
Prince of Wales.

467. During the visit of His Royal Highness the Prince of Wales, the train arrangements, notwithstanding the many difficulties and heavy demands on all available resources, connected with His Highness' journey, and the opening of the Alexandra Bridge, were most creditably and successfully conducted, and have already received the special recognition of the Government of India.

## AUDIT AND ACCOUNTS DEPARTMENT.

468. Though the changes in this staff have been frequent, and all its members new to open line work, the audit and booking of the accounts have been satisfactory, and the half-yearly accounts were printed and issued quite as promptly as expected. For open line work a special branch was added to the ordinary establishment of the Office of the Examiner

## STATE.

of Accounts. The cost of this branch, plus a proportion of the salary of the Examiner himself, bore to expenditure and earnings a ratio of respectively 5·6%, 3·4%, or 2·15% on expenditure plus earnings during the period under review.

469. The Examiner of Accounts has experienced much difficulty in consequence of the rawness and inexperience of the Station Traffic Staff, being, moreover, hampered by the want of the assistance of a permanent travelling Auditor of adequate qualifications. A remedy for these defects is necessarily receiving attention.

## INDUS VALLEY RAILWAY.

470. The general state of the works at the close of the financial year 1874-75, as described in the Annual Progress Report, was as follows :—

State of works at close of 1874-75.

471. In the Mooltan District the bank and bridges of 52 miles between Mooltan and the Sutlej river were ready for the broad gauge line ; a metre gauge tramway had been laid on this length. The 121 miles below the Sutlej river were in abeyance, the earth-work and many of the culverts being ready, and well-sinking had been commenced at the Sutlej bridge.

In Mooltan District.

472. In the Upper Sindh District, 30 miles of the upper end of the Reti Division were in abeyance ; the heavy viaducts above Sakkar to pass the Indus floods had been commenced, and the earth-works were well advanced ; nothing had been done in the 20 miles immediately below Sakkar, and nothing in the 3 miles forming the approaches to, and bridge over, the Indus. The earth-works of the next 45 miles were ready.

In Upper Sindh District.

473. In the Lower Sindh District, the works on about 70 miles of line north of the Laki cuttings were in abeyance, the embankment being, however, nearly complete. At the Laki cuttings about one-third of the required work had been done : on the 25 miles to the south of Laki the embankments were nearly ready ; and in the 54 miles near Kotri the works were being pushed forward with a view to an early opening of that length of line.

In Lower Sindh District.

## STATE.

Budget provision for works.

474. Some uncertainty existed in the earlier part of the year 1875-76 in regard to the extent to which funds could be supplied. The Indian grant of the Budget was at first limited to 52 lakhs of rupees, and the orders to confine appropriations to this sum were not relaxed until January, when the grant was increased to 67 lakhs of rupees. It was not until September, after some consultation with the Director, that the Engineer-in-Chief was able to settle a definite programme for the works of the year. This tended to retard progress on some parts of the line, as the preliminary arrangements for commencing and prosecuting the works during the cold weather were deferred till rather a late date.

Extraordinary floods of the Sutlej and Chenab rivers, and damage which resulted.

475. The year was marked by the occurrence of extraordinary floods of the Sutlej and Chenab rivers, whilst the inundations from the Indus, above and below Sakkar, were both later and less extensive than usual. The works at the Sutlej bridge sustained no injury whatever, though a good deal of damage was done to buildings in the Adamwahan colony, and to stores. In the Bahawalpur and Khanpur Divisions the waters of the Sutlej and Chenab rose to an unprecedented height, submerging and wrecking nearly 40 miles of the incomplete line, which had not previously been threatened. The damage done to the earth-works, culverts, buildings and stores amounted to a value of nearly two lakhs of rupees, and the question has been raised whether it would be better to divert this part of the line, so as to escape the chance of a recurrence of such a calamity, or to provide for its protection, by raising embankments along the banks of the rivers.

476. The works under execution in the part of the line crossed by the Indus floods suffered no injury.

Severe outbreak of fever at Sutlej Bridge works.

477. A very severe type of fever became prevalent after the flood season, especially at the Sutlej bridge. Matters there were so seriously bad in October and November, that an entire suspension of the works seemed to be inevitable. All the Officers of the Engineer and Subordinate Staff at Adamwahan were subject to repeated attacks, until sometimes there was not one fit for duty. The mortality among the workpeople was deplorably heavy. Every effort was made to mitigate and remedy the evil, and towards the end of December the severity of the sickness abated; but it left sad traces of impaired health which have not yet been effaced.

## STATE.

478. During the month of November 1875, the general estimate for the line was completed and submitted. It is necessarily a very bulky document, and its preparation had been much hindered by the occupation of the staff on works in progress. The compilation of all of the material had at last to be undertaken in the Engineer-in-Chief's Office.

Completion of estimates for the line.

479. A large quantity of work (*see* APPENDIX J) has been executed during the year in the preparation of building material, almost all of which is now ready in earth-work, in masonry, and in laying permanent-way. A further large supply of permanent-way material, station machinery, and other fittings has also been received from England.

Work executed.

480. Towards the close of the financial year a large purchase of rolling-stock for the line was made by the Director of State Railways, and at the same time 90 miles of line were found ready on which to employ it, and 20 miles more were expected to be ready by the end of April.

Rolling-stock purchased.

481. The following narrative describes in some detail the progress made in the works of each Division.

Progress made in each Division reviewed.

482. The Mooltan District of superintendence includes the Shujabad, Sutlej Bridge, Baháwalpur and Khánpur Divisions, and extends from the junction of the Indus Valley (State) Railway with the Sher Shah branch of the Sindh, Punjab and Delhi Railway,  $6\frac{1}{2}$  miles from Mooltan to the 172nd mile of the Indus Valley (State) Railway.

Mooltan District.

483. The embankments have been completed in this Division.

Shujabad Division—  
0 to 50th mile =  
50 miles.

484. The culverts and bridges, platform walls, tank towers and other brick-works have been completed.

485. Forty miles of the mètre gauge tramway of 40-lb. rails have been taken up, and the broad gauge line of 60-lb. rails substituted. The conversion to broad gauge of the remaining 21 miles of line, completing the line between Mooltan and the Sutlej river and the Hamdi store branch, will probably be finished in April; this part of the line will then be ready for traffic.

486. The quantities of work executed in this Division during the year are as follows :—

Quantity of work executed.

Earth-work	...	...	...	43 22 lakhs cubic feet.
Brick-work	{ Bridges	...	...	0 24 " "
	{ Other works	...	...	0 62 " "
Laying broad gauge permanent-way	46 $\frac{1}{2}$ miles.			

300,000 broad gauge sleepers have also either been manufactured or purchased in this Division during the year, and arrangements have been made for obtaining 100,000 more.

## STATE.

Transport of material  
for Sutlej Bridge.

487. The principal part of the business of the Division has been the transport of material for the Sutlej bridge. The metre gauge tramway has proved an invaluable aid ; indeed, it is not too much to say that the Sutlej bridge could not have been commenced had it not been connected by a railway with the sources of its supplies. Rough stone for the protection of the foundations formed the chief item of transport. 1,000,000 cubic feet, or 50,000 tons, were carried over the tramway from Hamdi to Adamwahan, a distance of 42 miles, during the year; and 200,000 cubic feet more were brought to the Hamdi wharf, and are stored there during the interruption of traffic on the line below Shujabad, caused by the laying of the broad gauge line. The whole of the iron permanent-way material for 46 miles of the Shujabad Division, 4600 tons, and of the sleepers 6600 tons, with 15,000 tons of miscellaneous stores, and ballast for 18 miles of line, weighing about 20,000 tons, were also carried over the tramway. The ton mileage of the year amounted to about 3,500,000 ton miles, and the cost of haulage to 3.75 pies per ton mile for all expenses except wear and tear of line and rolling-stock.

Transfer of metre  
gauge rolling-stock  
to Ghotki Division.

488. Five tank locomotive engines, class A, and 130 wagons, were employed on the metre gauge tramway ; more than half of these have been recently transferred to the Ghotki Division, and the remainder will be sent down immediately on the completion of the broad gauge line between Mooltan and Adamwahan.

Broad gauge rolling-  
stock.

489. Three ballast tanks and one mail tank broad gauge locomotive engines have been purchased from the East Indian Railway, and some ballast wagons have been hired from the Sindh, Punjab and Delhi Railway for constructive purposes on the broad gauge line in this Division.

Sutlej Bridge Divi-  
sion—50th to 63rd  
mile = 13 miles.

490. The Sutlej bridge will consist of 16 spans of 264 feet between centres. The piers will rest each on three brick-work cylinders 18 feet 9 inches diameter, with 5 feet thickness of steining, sunk to a depth of 100 feet below dry weather water level. The piers are distinguished by the letters A to R, from Adamwahan towards Bahawalpur.

Protective measures  
adopted in flood  
season.

491. Eighteen wells, forming the six foundations A, B, C, P, Q and R, had been commenced during the previous year, and, on the approach of the inundation season, a large quantity of stone was placed round each foundation. The wells in B and C had, by that time, penetrated to a depth of 60 or 70 feet, and were fairly safe ; those of A were resting on clay at a depth of 30 feet, but were so efficiently protected by

their position that there were no grounds for anxiety on their account. The wells of *P*, *Q* and *R*, however, were, from their situation, subject to the full violence of the floods, and they had only entered a clay stratum found at a depth of 30 feet, without penetrating to such an extent as would render them secure. With the concurrence of the Government 60,000 cubic feet of stone were placed around each of the foundations *C*, *P*, *Q* and *R*, and further protection was afforded to *A*, *B*, *Q* and *R* by the completion of the sunken blocks designed for the abutment spans, and by the provision of about a third of the large quantity of stone with which those spans and the abutment piers have to be filled and surrounded.

STATE.  
Protective measures adopted in flood season.

492. The full force of the floods, which were remarkably violent, was directed on *P*, the volume of the river passing between *P* and *Q*, and scouring out a channel 40 feet deep below flood-level, so far as could be ascertained from soundings taken in the rapid stream. The wells of *P* had barely reached this depth, and considerable anxiety was felt for their safety. Fortunately material was at hand, and 60,000 cubic feet more stone was added around the wells of *P*, as the supply which had been first applied subsided. It is satisfactory to be able to say that the bridge-works did not suffer the slightest injury, nor were the cylinders in the least disturbed. Altogether 785,000 cubic feet of stone were placed around the foundations during the season.

Bridge works successfully stood the force of the floods.

493. When the floods subsided, the river channel maintained its position between *P* and *Q*, and a high sand-bank formed on the Adamwáhan side, on which it would have been easy during the succeeding season to have pitched the whole of the wells of the 11 foundations remaining. A close inquiry having, however, been instituted into the state of the plant, most of which had seen long service on other works, and into the prospect of obtaining sufficient rails for weighting the wells, it was pronounced undesirable to undertake so much, and the work of the season was limited to seven new foundations—*D*, *E*, *F*, *G*, *H*, *I* and *K*. A very good start was made in October, and, notwithstanding the terrible sickness which prevailed for some time, a large amount of work has been done. APPENDIX F exhibits exactly the progress in well-sinking made during the year, and the condition of each foundation on the 31st March 1876.

Progress on well-sinking restricted owing to deficiency of rails for weighting

494. The training works, which were to all appearance successful in the previous season, failed before the violent floods of August 1875, and there is much reason to doubt whether any reliance can be placed on the temporary expedi-

River training works.

## STATE.

## River training work.

dents hitherto tried. A proposal has been submitted by the Engineer-in-Chief to construct long groynes of loose stone, in direct connection with the bridge abutments, as has been done at some of the bridges on the Sindh, Punjab and Delhi Railway.

Completion of Sutlej Bridge anticipated by June 1878.

495. If four spans of the iron-work can be delivered in India in September next, and if the whole can be supplied and shipped from England before 31st March 1877, there is good reason to believe that the Sutlej bridge may be completed and opened in June 1878 at the latest.

*Bahawalpur Division*—63rd to 122nd mile = 59 miles.

496. The works in this Division were in abeyance until November, when they were resumed. The heavy floods referred to in para. 475 of this report had damaged the line below Channi Gote, which is at the 100th mile, and as a diversion of the lower part might be necessary, progress has been confined to the works above Channi Gote.

Line ready for permanent-way.

497. The earth-works, bridges, station platforms and wells have been completed in this portion, and the line is ready for the reception of permanent-way.

Quantities of work executed.

498. The quantities executed during this year are as follows :—

Earth-work	...	...	58	lakhs cubic feet.
Brick-work in bridges	...	...	0.85	" "
" in station and other arrangements	}		0.5	" "

499. A large quantity of ballast prepared in previous years is ready along the line.

Branch line to the Chenab for transport of material.

500. A broad gauge branch line is about to be constructed from Channi Gote to the Chenab river, distant 14 miles, for the transport of permanent-way and other material to be delivered by the Sindh, Punjab and Delhi Railway Flotilla.

Conveyance, during dry season, of goods traffic of S. P. & Delhi Railway Flotilla by this Branch suggested.

501. It is possible that, in the dry season, this branch may also be utilized in connection with the goods traffic of the Sindh, Punjab and Delhi Railway Flotilla, the large steamers of which cannot proceed through the upper reaches of the river to Mooltan during the dry season. A suggestion has been offered by the Engineer-in-Chief that, for these eight months of the year, the traffic of the Sindh, Punjab and Delhi Railway might be brought over this portion of the Indus Valley State Railway, a temporary timber-bridge being thrown across the narrow channel of the Sutlej river, and that the terminus of the Flotilla service be fixed at the end of the branch. During the other four months, when the rivers are full, and the temporary bridge could not be maintained, the steamers reach Mooltan easily.



502. Owing to the destruction caused by floods, and the chance of a diversion of part of the line, work has not been resumed in this Division. Eight lakhs cubic feet of ballast material have been manufactured, and 18 lakhs of bricks for building. The staff has been recently employed on survey operations.

503. There will be no difficulty in completing the works of the line through the Bahawalpur and Khánpur Divisions in 12 months.

504. The Upper Sindh District of superintendence comprises the Reti, Ghotki and Larkana Divisions, and extends from the 172nd to the 338th mile, exclusive of the 3 miles between the 270th and 273rd mile, which form the Indus Bridge Division, under a Superintendent of Works, responsible to the Engineer-in-Chief.

505. The earth-works are completed; 100 lakhs cubic feet having been thrown up during the year.

506. Fifty-three of the culverts and minor bridges are completed, 16 are in progress and approaching completion, and 10 remain untouched. Thirteen of the culverts had been completed, and 17 commenced in the previous year.

507. Of the 23 large bridges in the Division, 17 of which are classed as major bridges, and 6, consisting each of 5 arches of 10-feet span, are among the minor bridges, 5 are finished, 8 are in hand approaching completion, 8 have been commenced recently, and are progressing favorably, and 2 have not yet been touched. Six of these bridges had been commenced before April 1875.

508. The gross quantity of concrete and brick-work in bridges executed in this Division during the year amounts to 958,000 cubic feet; and, at the bridges founded on wells, 4400 lineal feet of well-sinking have been executed.

509. APPENDIX G exhibits the present state of the works on the major bridges in this Division.

510. The manufacture of material in the 12 months has included 70 lakhs of sand-moulded bricks for building, and 65 lakhs of slop-moulded bricks for concrete ballast, enrockment and such purposes.

511. The preparation of ballast for the line was in abeyance during the year. Nine and a quarter lakhs cubic feet of burnt material collected previously are stacked along the line.

512. The works in this Division can easily be completed in the course of another season.

## STATE.

*Khánpur Division—*  
122nd to 172nd  
mile = 50 miles.

Material manufac-  
tured.

*Upper Sindh District.*

*Reti Division—*  
172nd to 221st mile  
= 49 miles.

Major and minor  
bridges.

Progress made in con-  
struction of bridges.

Quantity of work  
executed.

Major bridges.

Manufacture of ma-  
terial.

Ballast.

Works approaching  
completion.

## STATE.

*Ghotki Division—*  
221st to 270th mile  
= 49 miles.

513. The earth-works are complete, with the exception of 30 lakhs cubic feet of raising required in the Sangi Sub-division, which was deferred on account of the tramway being laid on the bank ; this will be made up during the inundation season. The gross quantity executed in this Division is 1561 lakhs cubic feet, of which 551.25 lakhs were thrown up during the year.
- Earth-work executed.**
514. Thirteen of the minor bridges in the Division are completed, 9 are in hand, well advanced, and the materials for 6 are at site.
- Minor bridges.**
515. Of the 36 major bridges, many of which are large viaducts, 2 are complete, 6 are in hand, and approaching completion, 9 have been recently commenced, and are progressing satisfactorily, and 19 have not yet been touched. In the general estimate of the line, 34 bridges only are classed as major bridges, but an alteration of the dimensions of two minor bridges, Nos. 2 and 70, brings them under the category of major bridges.
- Major bridges and viaducts.**
516. The total quantity of concrete and stone and brick masonry executed in this Division during the year amounts to three lakhs cubic feet ; and 4000 lineal feet of wells for foundations have been undersunk. The work in this Division did not fairly commence until January 1876 ; the Narra bridge, No. 91, 8 spans of 20-feet arches, with 2 culverts near it, being all that had been undertaken in the season before the inundation.
- Masonry works.**
517. APPENDIX H exhibits the present state of the works on the major bridges of this Division.
- Major bridges.**
518. Six lakhs cubic feet of broken stone have been collected at Rohri for ballasting the line ; this material will be used throughout the Ghotki Division.
- Ballast.**
519. A mètre gauge tramway is being laid for the transport of the large quantity of material which has to be moved in the Ghotki Division. Twenty miles of main line have been laid on the bank, with deviations, each containing a tressel bridge at the bridge sites. About 5 miles more have been laid in branches to the river at Sakkar, and to the several quarries at Rohri. The remainder of the main line is being rapidly urged forward, and it is hoped may be completed up to the northern end of the Division in a few weeks. Five mètre gauge tank locomotive engines and 100 ballast wagons are on the line, and 2 more engines, with about 60 more wagons, will shortly be brought down from the Shujabad Division.
- Tramway for transport of material.**

## STATE.

520. The manufactures during the year embraced 130 lakhs of bricks for building, 20 lakhs for concrete ballast, and 41 lakhs for soorkhee, of which 163,000 cubic feet were pounded. Sixty thousand cubic feet of lime-stone have also been delivered on the works. All the material required for the works, with exception of a few bricks for soorkhee, &c., have been manufactured, and there is a reasonable hope that the bridge-works of the Division will all be completed in the course of one more season.

Collection of material.

521. No work has been done in this Division during the year. The Superintendent of Works appointed to design the bridge has resided at Simla during the whole time in direct communication with the Director of State Railways and Consulting Engineer to Government of India for State Railways, with exception of a short interval passed by him at the Delhi Camp of Exercise.

*Indus Bridge Divn.—*  
Mile 270th to 273rd  
= 3 miles.

522. A preliminary report and estimate were submitted by him in the month of August, containing definite proposals, which were for the most part supported by the Engineer-in-Chief. No instructions have as yet been received on this report. In the meantime, the Superintendent of Works having been removed from the control of the Engineer-in-Chief, is engaged at Simla on drawings of details in furtherance of the design proposed by him.

Report and estimate submitted.

523. The working staff of the Division, resident at Sakkar, has been transferred to other Divisions for employment on works in progress.

Transfer of staff.

524. The earth-works of the 20 miles immediately below Sakkar are approaching completion; the work was commenced in December 1875. The embankments of the other 45 miles were completed in the spring of 1875; altogether 213 lakhs cubic feet have been thrown up during the year.

*Larkana Division—*  
273rd to 398th mile  
= 65 miles.

Earth-work.

525. A commencement has been made of the bridging. The foundation wells of two of the inundation bridges near Madeji and Alladadni are being sunk; and those of the large viaducts near Ruk have just been put in hand.

Bridges and viaducts.

526. The present condition of the works of the major bridges of this Division is shown in APPENDIX I.

Major bridges.

527. A number of small bridges and culverts have to be built for irrigation channels. There is no reason to doubt that the whole of the bridge-work of the Division may be completed within the next 12 months.

Minor bridges.

## STATE.

## Collection of material.

528. Seventy lakhs of bricks for building were manufactured during the year, and about 50 lakhs more have to be made to complete the quantity required. A large quantity of soorkhee has been pounded, and lime-stone has been delivered at convenient points along the line. The whole of the materials required for the bridges in the 40 miles at the southern end of the Division are at site of works.

*Lower Sindh District.*

529. The Lower Sindh District of superintendence includes the Mehar, Sehwan and Kotri Divisions, and extends from the 338th to the 498th mile, the junction with the Sindh, Punjab and Delhi Railway at Kotri.

*Mehar Division.—*  
338th to 391st mile  
= 53 miles.

530. The earth-works are complete ; 97 lakhs cubic feet having been thrown up during the year.

Construction of  
bridges commenced.

531. There are only 4 major bridges in the Division, and they are but small ; the other masonry works consist entirely of culverts and small bridges for irrigation purposes. A commencement has just been made on them, and the whole should certainly be completed in 12 months.

## Collection of material.

532. The greater part of the requisite material is ready ; only some 50 lakhs of bricks for building have still to be made, which will be prepared before the end of July.

Works in abeyance  
for want of funds.

533. The works of this Division were practically in abeyance until January, owing to the doubt about provision of funds for the line.

*Sehwan Division—*  
391st to 446th mile  
= 55 miles.

Earth-work well ad-  
vanced.

534. The embankments are completed to the north and south of the Laki hills, and the heavy cuttings through the hills are well advanced. It is expected that they will be entirely completed in September next. 343 lakhs cubic feet have been executed in the Division during the year, 178 of which were in the hard gravel and rock of which the Laki hills are composed.

## Masonry works.

535. Only 12 bridges have been built ; masonry works having been kept in abeyance until November. The excavations for foundations of the Sann river bridge, 23 spans of 40 feet, have been got out, and the masonry up to level of bed of river will be completed and secured before June. The bridge of 4 spans of 12 mètres, on well foundations, over the Arul river, and one of 10 spans of 6 mètres, are the only other large works in the Division. The former is about to be commenced.

	STATE.
536. The bridges already built are for the most part under the heavy embankments in the Laki hills ; though of small span, they contain a large quantity of work ; 170,000 cubic feet of stone masonry and 45,000 cubic feet of concrete have been executed in them.	Bridges completed.
537. Forty lakhs of bricks for building were manufactured during the year, and the 70 lakhs required to complete the works are being manufactured, and will be turned out by July.	Materials manufactured.
538. There is every reason to expect that the bridge and line works in this Division will be completed within the next 12 months, and as the platelaying may progress simultaneously with other works, from several points, that the Division may be ready for traffic in June 1877. It is proposed in September next to open 30 miles from Sann to Bucha, in extension of the Kotri Division, now ready.	Completion of works in one year anticipated.
539. The earth-works are complete ; 50 lakhs cubic feet having been thrown up during the year.	Kotri Division— 446th to 498th mile = 52 miles.
540. The bridges are complete, with exception of the group of 5 bridges over the Manjo Nai, aggregating 42 spans of 6 mètres, and 10 spans of 12 mètres. Four lakhs ninety-four thousand cubic feet of stone masonry and 87,000 cubic feet of concrete have been executed in the bridges during the year.	Bridges completed.
541. The station buildings, platforms, ashpits and signals are all ready, and the wells and water-towers are very nearly so ; 100,000 cubic feet of masonry and concrete have been executed in these works.	Station buildings, &c.
542. Nine lakhs cubic feet of stone ballast, completing the quantity required for the Division, were collected during the year.	Collection of ballast.
543. On 48 miles of main line and sidings, the ballast has been spread, and the permanent-way laid ; the 2½ miles in a temporary diversion round the Manjo Nai bridges being in hand.	Permanent-way laid.
544. The line through this Division, and up to Sann in the Sehwan Division, a length of 54 miles of main line, is now very nearly ready for running, but will be subject to interruption from floods of the Manjo Nai for some days in July or August. The bridges of this group cannot all be completed in less than 7 or 8 months ; some of them, however, should be ready before the flood season. The floods in this neigh-	Line nearly completed for running of trains.

## STATE.

Line nearly completed  
for running of trains.

bourhood result from rain in the hills to the west of the line ; the country falls with a sharp declivity, and the water passes off very rapidly into the Indus. That the Manjo Nai bridges should be still so far from completion has recently been noticed by the Engineer-in-Chief as an unsatisfactory feature in the management of the Kotri Division.

Interchange of traffic  
with S. P. & Delhi  
Railway at Kotri.

545. Arrangements have still to be made at Kotri for the interchange of goods and passengers between the Sindh Section of the Sindh, Punjab and Delhi Railway and the Indus Valley (State) Railway. The Engineer-in-Chief has deferred making final proposals on this subject, until he shall be informed of the nature of the management to be employed on the traffic of this line. In the meantime, the Indus Valley (State) Railway track enters the premises of the Sindh, Punjab and Delhi Railway Company upon a siding belonging to that Railway.

Junction of line with  
S. P. & Delhi Rail-  
way at Mooltan.

546. The junction with the Mooltan and Lahore Line is formed at  $6\frac{1}{2}$  miles from Mooltan on the Sher Shah branch of that line. The arrangement has already been productive of a good deal of inconvenience, and unless possession of the branch line can be obtained by the State, so that the traffic of the Indus Valley (State) Railway may terminate in, and be more easily controlled from Mooltan, it may perhaps be found necessary to extend the Indus Valley (State) Railway, and form a joint terminus with the Sindh, Punjab and Delhi Railway at that place.

Supply of creosoted  
fir and deodár  
sleepers.

547. A sufficient number of creosoted fir sleepers have been obtained in England, and are now in course of delivery at Karáchi, for the 226 miles of line south of Sakkar ; the 272 miles north of that place will be sleeperved with deodár from the Punjab forests. Deodár sleepers for 220 miles have been purchased and manufactured, and arrangements have been made for the delivery of all the remainder to be completed by the 31st of March 1877.

Permanent-way ma-  
terial.

548. Two hundred and eighty miles of iron permanent-way material have been received at Karáchi, or are now in course of delivery at that port ; 150 miles have been sent forward to their destination by the Sindh, Punjab and Delhi Railway Flotilla and by country boats, the Flotilla not being possessed of carrying power sufficient to deliver the material as rapidly as was necessary. It is understood that arrangements have been made in England for the supply of the whole of the remainder of the iron permanent-way material for the line, and for its shipment before 31st March 1877.

## STATE.

## Telegraph.

549. The telegraph line has been completed from Mooltan to Khánpur, 140 miles ; from Reti to Sakkar, 72 miles ; and from Radhan to Kotri, 145 miles. The intervals of 62 miles between Khánpur and Reti, and of 79 miles between Radhan and Sakkar, will be made good during this season.

550. In conclusion, it may be said that there is a fair prospect of the line between Kotri and Sakkar, 224 miles, being opened in June 1877, and of the upper section, between Sakkar and Mooltan, 272 miles, except the Sutlej and Indus bridges, being completed and opened by December 1877. If the arrangement for delivery of the Sutlej bridge iron-work, hitherto proposed, be adhered to, viz., that a half be delivered in England before March 31st 1877, and the remainder before 31st December 1877, the bridge cannot be well opened before March 1879 ; but if these deliveries can be so advanced, that three or four spans may be delivered in Karáchi by September 1876, and the remainder be shipped from England before 31st March 1877, there is a fair assurance that the bridge may be opened at the latest by June 1878.

Approximate dates by which the several sections may be opened for traffic.

## RAJPOOTANA STATE RAILWAY.

551. When a railway has been so far finished that trains can be run upon it, although it is still incomplete in details, its difficulties are great. A working staff has to be collected and organized : in India it has also to be taught, unless those who have been rejected after trial on other railways are employed. And when with such a staff a considerable traffic has at once to be carried, the difficulties are increased.

Difficulties to contend with on opening of a Railway in India.

552. This has been the history of the Rajputana Railway during the year 1875-76 :—

Dates of opening of line and extensions.

On 1st April 1875, the 328 miles of railway stretching from Sambhar to Agra and Delhi were open, the length from Jeypur to Sambhar having been opened in the previous month. No extension took place until 1st August, when Ajmere, 48½ miles from Phalera (Sambhar Junction), was brought into the railway system. On 14th February 1876, the 14½ miles between Ajmere and Nasrábad were opened for traffic, while on 1st January the bridge across the Jumna at Agra had been opened for the passage of broad gauge trains.

## STATE.

Expenditure to 31st  
March 1876.

553. The details of expenditure up to 31st March 1876, under the prescribed heads of account, are given in an appendix (M) to this report. The figures are approximate as regards one month, for the accounts of the year are not yet closed. The expenditure on the line to date, as shown in the appendix, has been Rs. 2,21,33,877.

Length of line open,  
and earnings.

554. During the year 1875, there were on the average 344.35 miles of line open and under working. Rs. 11,18,692 were expended in carrying traffic in 517,475 train miles, which earned Rs. 17,46,962, leaving Rs. 6,28,270 or 35.4 per cent. of the earnings as net profits.

Incident of cost of  
Departments.

555. In round figures, the Maintenance of the line cost 30 per cent. of the whole expenditure; the Locomotive and Carriage branch 38 per cent.; the Traffic branch 16 per cent.; while general administration and miscellaneous expenses swallowed up the remaining 16 per cent.

Per-centage of earn-  
ings from coaching  
and goods traffic.

556. Of the earnings, Coaching traffic contributed about 35 per cent., Goods traffic 62 per cent., and Sundries 3 per cent.

557. The details of the traffic and the way in which it was carried are set forth in order in the section of this report which deals with the Traffic Department.

## ENGINEERING DEPARTMENT.

Changes in Engineer-  
ing Staff.

558. In August 1875, after seeing the Jumna Bridge so far completed that an engine was taken across it, Mr. W. C. Furnivall, who had been Engineer-in-Chief, left the line to join the new appointment to which he had been transferred, and Mr. H. Bell assumed charge of the Engineering Department as Superintendent of Way and Works.

Completion of Jumna  
Bridge.

559. The chief work of the year was the completion of the Jumna Bridge, which proved under severe tests to be exceptionally stiff, and was opened for broad gauge traffic on 1st January 1876. The bridge has both broad and narrow gauge tracks; the latter being needed to carry trains to the transshipment or goods transfer station, which has been in progress on the left bank of the river and is now almost complete, with a platform 1,200 feet long, partly roofed, and sidings for both gauges.

Agra Fort Station.

560. The Agra Fort Station on the right bank of the river has not yet assumed its permanent shape, owing to the alterations of design which the alignment of the Sindia State Railway and experience of the requirements of the broad gauge traffic have shown to be necessary. Full estimates and designs are under submission, and immediate wants have been met by the erection of a passenger shed and offices.



	STATE.
561. At the Western extremity of the line, 48½ miles of railway between Phalera and Ajmere were completed in August 1875, and 14½ miles, completing the connection with Nasrábad, in February 1876.	Completion of extensions.
562. The construction of the central workshops at Ajmere was commenced.	Workshops.
563. Various works of completion and improvement were in progress during the year. Rest sheds for passengers were built at Bhartpur, Mandáwar, Dosa, Jeypur, Bandikui, Baswa, Rájgarh, Alwar, Rewári, Jataoli, Garhi Harsaru and Gurgáon. New rest sheds at Delhi and Ajmere were also in hand.	Rest-houses for travellers.
564. Quarters for European and Native employés which were very much needed were built at Agra, Bandikui, Ajmere and other places on the line. Some are still incomplete, as at Phalera and Jeypur.	Quarters for staff.
565. Refreshment rooms were built at Jeypur, and new Offices which will increase the refreshment room accommodation at Bandikui made some progress.	Refreshment rooms.
566. The engine-shed and the Store-shed at the Agra Cantonment Station were completed, and the temporary Locomotive Workshops established there.	Engine-shed, Agra Cantonment Station.
567. The engine-sheds at Bandikui and Phalera were also completed, and a temporary engine-shed was built at Ajmere, while the permanent-shed made good progress.	Engine-sheds.
568. The Amanishah bridge of 4 spans of 40 mètres was completed and after due inspection and test opened for traffic. The 12 and 18 metre girders in place on different bridges of the line were strengthened.	Completion of Amanishah Bridge.
569. While these and other works of construction were going on, the open line had to be maintained. The Delhi District was maintained departmentally, but the Agra District by contract. The section between Agra and Bhartpur was, however, brought under departmental maintenance when the period of the contract expired.	Maintenance of line.

## STATE.

Reduction of supervising establishments.

570. The approaching completion of the line made it necessary to reduce the supervising establishments, and to extend the boundaries of divisional charges. The number of Executive Divisions on the whole 394½ miles of open line was reduced to three, while the Ajmere Shops and neighbouring works of construction formed a separate division. Throughout the whole year gradual reductions were being made in the office and other establishment, and the subordinate staff employed on construction was being gradually changed into a staff suitable for maintenance.

Damage to line by heavy rain-fall.

571. With regard to this work of maintenance the only matter that need here be recorded is the interruption of communication in September 1875 by floods which breached about one-third of the 25 miles of the line nearest to Delhi. There was an unprecedented rain-fall in the neighbourhood, upwards of 19 inches being registered in 24 hours, and the waters poured down from the uplands east of the line and swept everything before them. By the strenuous exertions of Mr. Buyers, Executive Engineer, and his Assistants Mr. Thomson and Lieutenant Scott, diversions nearly 8 miles in length were laid within a week and run over in ten days from the first fall of rain, although the weather was most unfavorable throughout the time. The works of permanent reconstruction and the additional bridges found necessary on this section will be completed before the rains of 1876.

Rails and sleepers renewed.

572. 339 rails, or about one in 523, were renewed during the year 1875 on the whole line. In the same period 4,058 sleepers were renewed out of 816,347 in the road.

## TRAFFIC DEPARTMENT.

Traffic Department.

573. Mr. I. O'Callaghan remained the executive officer of this department as Traffic Superintendent, and was assisted by Mr. P. D. Barclay.

Number of passengers booked and average distance carried.

574. In the year 1875, 998,853 passengers were booked and carried an average distance of 53 miles, against 685,409 passengers carried an average of 35 miles the year 1874, showing an increase of 313,444 passengers and of 18 miles in the average length of journey. The passenger mileage, or number of passengers carried one mile, in 1875 was 52,557,488, or about 418 passengers per mile open per day.

Earnings from passenger traffic.

575. The earnings from passengers were Rs. 5,71,615 in 1875, against Rs. 2,16,425 in 1874.

576. The number of passengers booked at each station in 1875 is as follows:—

STATE.  
Passengers booked at each station.

STATIONS.	PASSEN- GERS BOOKED.	STATIONS.	PASSEN- GERS BOOKED.
Agra Fort ...	88,734	Sali ...	1,647
Agra Cantonment ...	8,719	Tilonia ...	1,343
Bichpuri ...	10,638	Kishangarh ...	9,907
Achnera ...	19,506	Ladpura ...	1,610
Ikran ...	4,788	Ajmere ...	88,722
Bhartpur ...	70,182	Delhi ...	122,894
Helak ...	4,612	Delhi Camp, (Temporary Station) ...	3,895
Nadbai ...	11,246	Palam ...	15,988
Kherli ...	12,199	Gurgaon ...	44,675
Mandawar ...	12,912	Garhi Harsaru ...	28,935
Biwadi ...	6,228	Sultanpur (Flag Station) ...	779
Bandikui ...	24,878	Farukhnagar ...	15,209
Arna ...	5,698	Jatauli ...	24,373
Dosa ...	23,126	Khalilpur ...	6,664
Jatwara ...	5,604	Rewari ...	69,222
Basi ...	8,881	Bawal ...	7,981
Kanota ...	3,674	Ajeraka ...	10,286
Sanganer ...	3,333	Harsauli (Flag Station) ...	1,720
Jeypur ...	111,145	Khirtal ...	11,092
Dhankia ...	2,917	Barwara ...	2,490
Asalpur ...	6,325	Alwar ...	69,048
Phalera ...	8,186	Malakheri ...	12,280
Sambhar ...	12,840	Rajgarh ...	27,021
Naraina ...	2,676	Baswa ...	7,630
		TOTAL ...	998,853

577. The fares in force were 8 annas, 4 annas and  $1\frac{1}{2}$  annas per station distance, averaging about  $8\frac{3}{4}$  miles. The equivalent rates per mile, calculated from the actual distances traversed, were 9.74, 5.07 and 2.01 pies for the 1st, 2nd and 3rd classes. The cost of carrying each passenger one mile according to the authorized system of calculation was, in the 2nd half of the year 1875, 36.02, 11.97 and 1.26 pies; and in the first half of the year 39.12, 9.87 and 0.95 pies for the 1st, 2nd and 3rd classes respectively. The second half of a year always gives a less favorable result than the first half, and the opening of a new section threw heavy maintenance charges on the revenue account of the former period, and caused the inequality of the two results.

Passenger fares in force.

578. The table only shows the number of passengers booked at each station, and does not show where these passengers went or how far they travelled by rail. It would occupy too much space if this were here repeated in the complete detail in which it is recorded, but a brief summary of the traffic at the chief stations may be useful as showing the comparative intercourse between different places.

Review of passenger traffic at the principal stations.

## STATE.

## Agra Fort and Cantonment Stations.

579. At Agra 92,453 passengers were booked. Of these 10,815 stopped at Achnera, and 25,955 at Bhartpur. Alwar received 1,628 direct, and probably a few more out of 2,374 who took tickets for Bandikui. 24,826 travelled to Jeypur and 4,702 to stations west of Jeypur.

Agra has by the last census nearly 150,000 inhabitants, and the number of passengers leaving it by the E. I. Railway during the past few years has averaged in round figures 150,000 a year. So it seems that although the fares on the State Railway are only two-thirds of those on the E. I. Railway, less than two passengers were booked to Rájputana for every three to the N. W. Provinces.

## Bhartpur.

580. This city sent forth 70,132 travellers by rail. 26,708 of them went to Agra, 10,822 to Jeypur, 1,347 west of Jeypur, 2,834 and a few more who halted at Bandikui, to Alwar. The neighbouring villages of Achnera, Nadbái and Kherli received 6,420, 3,084, and 6,145 respectively.

## Jeypur.

581. At this city 111,145 passengers were booked. To the westward went 40,735 of them, but their destination cannot be given, for the railway was opened in sections during the year, and many of those who halted at Sambhar when it was the limit of the open line would doubtless have been glad to have been carried further on their way to Kishangarh or Ajmere. But the journeying of the eastward passengers is less uncertain: 9,745 went to Bhartpur and 23,140 to Agra. 5,000 went straight to Alwar, and probably a few more out of 5,592 who halted at Bandikui; 1,153 stayed at Rájgarh and 2,590 at Rewári, while 6,443 were carried to Delhi.

It should not, however, be at once assumed that the intercourse between Jeypur and Bhartpur is greater than that with Alwar, for there was a double train service between the first two places, and only a single and not very convenient service between Jeypur and Alwar.

If the population of Jeypur be taken at 175,000, an estimate which is understood to be accepted by the Political Agent, then the proportion between inhabitants and railway passengers is almost the same as in Agra.

## Ajmere.

582. To this place the railway was open only five months, but in that time 38,722 passengers were booked. Of these 1,470 went to the neighbouring station of Ladpura, 6,680 to Kishangarh, 833 to Naraina, 1,864 to Phalera and Sambhar, 19,473 to Jeypur, 1,206 to Bhartpur, 3,581 to Agra, 236 to Alwar and 566 to Delhi.

	STATE.
583. It will be interesting to note in future years how these figures are modified as the people become accustomed to the use of the Railway.	Ajmere.
584. The trains were worked under the absolute block system effected by line clear messages without serious difficulty, although delays were caused at times to following trains.	Trains worked under the block system.
585. There are two wires in use on the line, and Morse instruments are employed. A third wire has recently been stretched between Agra and Jeypur and Preece's train-signalling instruments are about to be tried as soon as the battery power and other details are fixed. Electric communication was well maintained during the year under the supervision of Mr. Rutherford, Assistant Telegraph Superintendent.	Telegraph.
586. The mixed trains were run at a booked speed between stations of 15 miles an hour. The stoppages at way side stations varied from 3 to 12 minutes, including the time spent in watering at those stations where water has to be taken from columns intended only for trains running in the contrary direction. These delays are now being shortened as men get smarter in their work, for they were wearisome to European passengers, and were indeed at times exaggerated by drivers new to the line who, in their anxiety to be punctual, ran too fast between stations and had to wait for time at the platforms.	Speed of trains.
587. Two trains a day were provided for passengers between Delhi and Rewári, and between Agra and Jeypur, but on the remainder of the line only one passenger train was run in each direction. There were not vehicles or engines enough for a greater service.	Passenger train service.
588. The traffic was not sufficient to warrant the running of even these trains for passengers only, but by running mixed trains of goods and coaching vehicles the expenditure was more than covered.	Traffic not sufficient for a purely passenger service.
589. At the close of the year arrangements were almost completed for extending the double mixed service throughout the line.	Steps taken for extending the double mixed service.
590. Mixed trains are not so easily worked with punctuality as light passenger trains, and the working of the Rájputana Railway is complicated by the necessity of focusing trains at Bandikui junction, so as to suit the convenience of passengers and mails travelling on each of the three lines which radiate from that station.	Difficulty in working mixed trains to time.

## STATE.

Delay also caused by focussing of trains at junctions.

591. Where there is focussing there must be a stoppage to allow of transfers from one train to another, and to provide for possible unpunctuality. For the delay to one train beyond the margin allowed throws out two others. This caused some inconvenience to the passengers from the Delhi branch to the Agra line, as when trains were punctual they had to wait an average of an hour for their trains.

Measures taken to reduce delays.

592. With increased platform accommodation now being designed, and with assured punctuality of trains, the delay will be capable of some reduction.

Failure in punctuality.

593. But during some portion of the year there was a failure in respect to punctuality, from various causes ; chief among which was the incompleteness of the training of part of the staff.

Improvement in punctuality.

594. At the close of the official year much improvement had been effected, as will be seen from the following statement of the running of all trains carrying passengers during the last month of the year :—

Between Delhi and Rewári 62 trains were run. Of these 57 arrived true to time, 2 were stopped by the temporary line being flooded, and 3 were a few minutes late.

Between Delhi and Bandikui 62 trains were run. Of these 57 arrived true to time, and 5 were late.

Between Agra and Jeypur 62 trains were run. Of these 59 arrived true to time, and 3 were late.

Between Agra and Ajmere 62 trains were run. Of these 57 arrived true to time, and 5 were late.

In all, 230 trains arrived true to time out of 248 that were run.

Difficulty experienced in obtaining competent establishment for traffic requirements.

595. There were other matters in which some improvement was effected, but in which much still remains to be done. The railway was rapidly opened, section after section being taken into working as soon as a train could be run and before rolling stock or conveniences for so considerable a traffic as presented itself were complete. Want of conveniences for railway working means, want of punctuality and smartness, and failure in public accommodation. The short supply of rolling stock made it necessary to keep carriages running when they would otherwise have been sent to shop for repairs ; and other temporary troubles were experienced. Allusion has already been made to the incompleteness of the training of the staff, and this was a very serious difficulty in the management of the Traffic Department. Telegraph schools were open in which probationers were taught signalling, but a con-

siderable proportion after acquiring this technical skill show themselves lacking in the ordinary qualities which a Traffic servant should possess and have to be discharged. Natives are found to come in large numbers in search of any sedentary employment ; but it is very difficult to get men qualified to be guards, or to hold active posts.

STATE. .  
Difficulty experienced in obtaining competent establishment for traffic requirements.

On the other hand, a large proportion of the Europeans who come for employment are intemperate.

596. The establishment employed for working the Traffic staff. traffic at the 46 stations on the line was as follows :—

3 Inspectors.	90 Pointsmen.
51 Station Masters.	48 Khalásies.
92 Asst. Station Masters and Signallers.	91 Watermen.
51 Station Clerks.	50 Sweepers.
12 Jamadárs of Pointsmen.	15 Lampmen.
	8 Peons.
	4 Waiting room attendants.

597. In addition to the above, 15 extra Hindu Watermen were engaged for the months of the hot weather, so that there might be 3 men to give water to passengers at each large Station, and 2 men at each small Station.

Establishment for supply of water to passengers.

598. The Inspectors and eight or ten of the higher Station Masters were Europeans, but the others were natives from different parts of India.

Nationality of staff.

599. It has not been found practicable to make any definite rule as to the nationality of the men employed. Station servants are generally drawn from the immediate neighbourhood of the place where they work, but the field from which Station Masters and Clerks are selected cannot at present be narrowed, as the necessary knowledge of English requires a wider search. At one period of the year it was ascertained that out of 513 persons employed in the Traffic Department—

State of education.

204	were illiterate,
13	could read Hindi,
41	„ Nágri,
9	„ Urdu,
246	„ English, and in most cases

one or more native characters.

## STATE.

Arrangements for loading and unloading of goods.

600. Besides the foregoing men, loading coolies were employed in fluctuating numbers. At the large stations, the goods were loaded and unloaded by Contractors, who were paid at rates varying from Re 2-4 to Re 3-8 per 1000 maunds. At five intermediate stations where it was inconvenient to employ Contractors, the Station Masters were allowed to contract for the work at the rate of Re 2-8 per 1000 maunds. At small stations, where there was but little goods traffic, the packages were loaded and unloaded by the ordinary station servants.

Cart service for transport of through goods at Agra.

601. Pending the completion of the transferring arrangements at Agra, a cart service had to be maintained for the carriage of through goods between the East Indian and Rájputána Railway Stations which lie on opposite banks of the river. This was managed entirely by the State Railway, and involved the cartage of 1,200 or 1,300 tons a month.

Passengers' luggage carried under the same conditions as on other Indian Railways.

602. Passengers' luggage was carried on the same conditions as are in force on other Railways in India, as, although the restrictions on the amount which a passenger can take with him in his carriage free of charge and the system of booking are alike troublesome, it was considered better to maintain uniformity in this respect until more rolling-stock was available.

Third class carriages fully worked.

603. The average number of passengers in a 3rd class carriage with 32 seats was 17, but during some portions of the journey of most trains there have been no spare seats. That the carriages have been fully worked is shown by the fact that the average mileage run by each 3rd class vehicle on the line was 104 miles a day, in spite of the shortness of the trips and the moderate speed of the trains.

Separate carriage provided for females.

604. In every through passenger train a woman's carriage was provided, and was generally very well filled. Women are not made to travel in this carriage unless they wish it. One complaint was received during the year about the entry of dancing girls into the women's carriage ; and orders were issued to prevent this as far as possible.

Refreshment rooms and other conveniences for passengers.

605. Benches with jars of water in charge of a waterman were provided in some of the waiting sheds for native passengers, and are being placed in all the sheds. Fruit and sweetmeat sellers were allowed to attend on station platforms without charge on the nomination of Station Masters, their names being registered by the police. At chief stations, a small deposit is lodged by the men thus registered as security



## STATE.

for their good behaviour and for the quality of their wares. For European passengers, 1st and 2nd class refreshment rooms were built and opened at Jeypur. At Bandikui Junction, a second class refreshment room was commenced, but is not yet ready; at Rewári one of the rooms of the station building was turned into a refreshment-room. Advice of passengers requiring meals is telegraphed by the railway free of charge to the managers of the refreshment-rooms.

Refreshments rooms and other conveniences for passengers.

606. Time and fare tables in the vernacular are exhibited at the stations.

Vernacular time and fare tables.

607. Lists of fairs and festivals are obtained from the Civil Officers along the line, and preparations made for carrying additional passengers, but there is great irregularity in this traffic, and it is difficult to foretell whether in any one year a given fair will attract many persons. The chief traffic of this kind was to Delhi from neighbouring towns and villages, on several occasions to Ajmere in the beginning of August, and again in November for the Pohkar Fair. By making use of all kinds of stock about 10,000 people were conveyed to Ajmere on the last occasion, when special additional booking offices were built for the convenience of passengers and special trains were run.

Arrangements made for meeting the passenger traffic of fairs and festivals.

608. During the winter of 1875-76 large bodies of troops were massed in the neighbourhood of Delhi in Camps of Exercise, and two special temporary stations were opened for their accommodation. The Quarter-Master-General was good enough to place the services of two Non-commissioned Officers at the disposal of the Railway for duty at these stations, and about 12,000 troops were carried to and from these places without any misadventure, and to the satisfaction of His Excellency the Commander-in-Chief.

Temporary stations erected in neighbourhood of Delhi in Camps of Exercise.

609. There was also during the year much special traffic to and from Agra in connection with the gathering of the Princes and Chiefs of Rájputána to pay their respects to H. R. H. the Prince of Wales. His Royal Highness was conveyed on the line by special trains from Agra to Bharthpur and back, and again from Agra to Jeypur and back. Lunch was provided by the Railway for H. R. H. and Suite at Bandikui Station, which was decorated for the occasion.

Train service during visit of H. R. H. the Prince of Wales.

## STATE.

Agra Fort Station—  
Difficulty experi-  
enced in carrying  
the traffic, owing  
to its incomplete  
state.

610. Agra Fort Station was also draped and decorated on each occasion of its being used by His Royal Highness. This station was opened for broad gauge passenger traffic on 1st January 1876, having previously been used for narrow gauge traffic only. In its incomplete state some difficulty was experienced in carrying the great traffic at the time of the Prince's visit, but the East Indian Railway Company agreed to the loading up of horses and carriages on their old platforms and the traffic was managed without mishap. The improvement and completion of the station is in hand.

## Accidents.

611. The number of accidents that occur on the line are published annually in detail. The only serious accident requiring to be noticed here occurred in December 1875, when a Driver of a goods train failed to pull up at signals, which were not, however, properly placed, and ran on to the Jilána bridge when it was under repairs. The Driver jumped off and was injured. There were 35 cases of running over cattle in the year without any injury being sustained by the trains, but in April 1875 one of the contractors' trains ran over a bullock near Jatwára, and eight wagons were thrown off the line.

## Injuries to the person.

612. During the year 1875-76, one passenger was killed from want of caution—a woman, who got down unperceived between some carriages while standing in a station; and three were injured. One child was also injured by having its fingers squeezed by a peon in shutting a door. Two railway servants were killed, and two injured by their own misconduct or want of caution.

## Obstructions placed on line.

613. There were several occasions in which obstructions were placed on the line, but fortunately no injury occurred in any case. It is difficult to classify these by causes. In some cases spite seems to have been a motive, in others domestic quarrels. One man runs away with another man's wife, and after much tribulation the injured man or his friends place a log of wood on the railway, and sometimes tie a message to the nearest telgraph post, saying that they propose to repeat the operation till justice is done.

## One offender detected and punished.

614. The Railway Police in a recent instance succeeded in tracing a case of obstruction home to one of the offenders, and he was sentenced to transportation for life. It may be hoped that this severe sentence will deter others from repeating so dangerous an offence.

## GOODS TRAFFIC AND TRADE.

STATE.

615. The following table shows the weight of different kinds of goods booked in 1874 and 1875.

Weight of different goods carried.

COMMODITIES.	1875. Tons.	1874. Tons.	DIFFERENCE.		REMARKS.
			Increase. Tons.	Decrease. Tons.	
Baggage, &c. ...	367.9	...	367.9		
Betel-nuts ...	64.5	...	64.5		
Books and Stationery ...	78.5	13.4	65.1		
Building Materials ...	705.6	...	705.6		
Charcoal ...	59.3	...	59.3		
Coal ...	139.4	58.8	80.6		
Cotton ...	9,022.9	1,285.3	7,737.6		
Drugs ...	67.0	...	67.0		
Dyes ...	511.4	...	511.4		
Fruits, fresh and dry ...	1,396.5	768.6	627.9		
Furniture ...	117.2	84.6	32.6		
Flour ...	...	92.6	...	92.6	Shown under
Ghi and Oil ...	182.0	118.6	63.4		Miscellaneous
Glass and Crockery ...	74.8	...	74.8		in 1875.
Grains and pulses ...	24,061.9	5,192.1	18,869.8		
Gums ...	...	235.9	235.9		
Gunny bags, &c. ...	1,065.6	752.6	313.0		
Hardware ...	1,681.8	...	1,681.8		
Hides and Leather ...	922.4	406.7	515.7		
Jute and Flax ...	...	14.2	...	14.2	Do. Do.
Metals ...	892.9	466.9	426.0		
Military Stores ...	12.3	...	12.3		
Miscellaneous ...	1,172.8	2,230.0	...	1,057.2	Distributed under
Oil-cake ...	132.6	5.0	127.6		proper
Oilman's stores ...	481.3	40.4	440.9		heads.
Piece-goods, English ...	731.4	741.2	1,027.7		
Ditto., Country ...	1,037.5				
Railway Materials ...	14,788.9	36,922.1	...	22,133.2	Shown under
Rice ...	...	4,589.5	...	4,589.5	Grains and
Safflower ...	174.4	251.9	...	77.5	Pulses.
Salt ...	72,888.2	54,623.3	18,264.9		
Saltpetre ...	101.2	...	101.2		
Seeds ...	813.5	791.9	21.6		
Spices ...	228.9	47.1	181.8		
Stone ...	2,295.7	821.6	1,474.1		
Sugar ...	19,679.3	5,866.3	13,813.0		
Sulphur ...	5.3	17.2	...	11.9	
Telegraph Stores, Govern- ment ...	17.9	41.6	...	23.7	
Timber ...	530.5	484.7	45.8		
Tobacco, Raw ...	268.1	21.6	269.3		
Ditto, Manufactured ...	22.8				
Turneric ...	642.9	39.4	603.5		
Wines, &c. ...	148.5	69.7	78.8		
Wool ...	175.7	134.9	40.8		
Woolens ...	87.6	33.4	54.2		
Total ...	158,084.8	117,001.3			
Net increase			41,083.5		

616. Excluding Railway materials and Telegraph stores, the consignments of which naturally fell off as the railway was brought towards completion, 143,278 tons of various goods were booked in 1875, against 80,037 tons in 1874.

Aggregate weight of goods carried.

## STATE.

Average distances  
goods travelled.

617. The average distance which these public goods travelled has been increasing as the line was opened out, the figures of average mileage being—

1st half 1874,	41·59 Miles.
2nd „ „	60·49 „
1st „ 1875,	85·32 „
2nd „ „	107·25 „

Ton mileage of goods.

618. Expressed as tons of goods carried one mile, the ton-mileage of all goods was 14,351,459 in 1875 and 5,111,844 in 1874.

Traffic confined to  
a few great staples  
of trade.

619. It will be seen from this list that the traffic is chiefly confined to a few great staples of trade. Of the 143,278 tons of goods carried in 1875, salt accounts for 72,888 tons, grains and pulse for 24,062 tons, sugar for 19,679 tons, and cotton for 9,023 tons ; these four commodities making up six-sevenths of the whole trade.

Goods brought by  
broad gauge rail-  
ways.

620. The broad gauge railways, which touch the Rájputana Railway at Agra and Delhi, brought to it 25,425 tons and took away 28,093 tons, which were booked through and were not warehoused in Agra or Delhi. But the agency firms at Agra have not yet allowed the whole traffic between Rájputana and the N. W. Provinces to pass out of their hands, for all the salt sent from Sambhar and Bhartpur is still placed in their godowns, and subsequently despatched by the East Indian Railway or by river, and some of the return traffic is also warehoused by them.

Goods traffic received  
by Delhi and Agra  
from Rájputana.

621. Thus, besides the through traffic mentioned above, and excluding railway and telegraph materials, Agra received 55,131 tons from Rájputana, and returned 7,857 tons of various goods. Delhi received from Rájputana 5,754 tons, and returned 4,962 tons.

Is through traffic.

622. Neither Agra nor Delhi are manufacturing cities, nor does Rájputána supply them with much beyond salt, and a little grain that is consumed within their walls. The traffic mentioned in the last paragraph then merely halts on its way between distant places and is really through traffic.

Assumed weight of  
this traffic, in tons.

623. This leads to a conclusion worth following out. Agra has 150,000 inhabitants ; the consumption of salt in food and ordinary manufactures can hardly be in excess of 1,000 tons a year, and the remainder that is imported from Rájputána must be distributed. A similar assumption may probably be made for Delhi without serious error. As regards grains and pulse, 3,037 tons were imported from Rájputána into Agra and 1,307 tons into Delhi, and it may be assumed

that the whole of this was consumed in those cities. On this assumption the figures will be—

			Tons.
'Through' goods from Rájputána ...	...	...	28,093
Do. to Do. ...	...	...	25,425
Goods booked to Rájputána			
from Agra...	...	...	7,857
from Delhi ...	...	...	4,962
Do. „ Rájputána to Agra	55,131		
Less, Salt consumed	1,000		
Grain and Pulse	3,037	4,037	51,094
Do. from Rájputána to Delhi	...	5,754	
Less, Salt consumed	1,000		
Grain and pulse	1,307	2,307	3,447
Total			120,878

STATE.  
Assumed weight of  
this traffic, in tons.

624. These 120,878 tons show the railway traffic of Rájputána with the outer world, of which the gates are Agra and Delhi. But it has been already shown that only 143,278 tons were booked on the whole line during the year, so that 21,400 tons represent the total weight of goods brought to the line inside the terminal stations of the Rájputána Railway and despatched by rail to places lying within its limits.

Internal and external  
trade of Rájputána.

625. It must not, however, be concluded that the 21,400 tons were entirely local Rájputána traffic. Rewári is a place where salt and sugar and grain are stored, and re-despatched as the market requires. A little more than 10,000 tons of salt bound for Delhi and sugar and rice which had come thence were thus stored, and must be deducted from the 21,400 tons, leaving about 11,000 tons only as the internal traffic of Rájputána along the line traversed by the Railway.

626. This internal traffic consisted mainly of food grains, building stone, salt for local consumption, and cloths of native manufacture. A few tons of oil seeds are sent from the villages to the larger towns; and skins and hides are sent about from one place to another without showing any particular concentration for dressing, but two-fifths of all the leather comes from beyond the borders of Rájputána.

Internal traffic mainly  
food grains.

627. The few luxuries of the people also come from a distance. The chief of these is sugar, of which 19,679 tons were sent from Oudh, Rohilkhand and the Punjab to all Stations. Fruits, fresh and dry, may perhaps be counted as foreign luxuries, and 1,396 tons of them were distributed. A few dyes (511 tons), a little tobacco (291 tons), some hardware

External traffic most-  
ly luxuries of the  
people.

## STATE.

- External traffic mostly luxuries of the people.** and metal (893 tons), and a small amount of English piece-goods (893 tons), sum up the chief luxuries from abroad which Rájputána obtained by railway in return for its cotton and salt.
- English piece goods carried.** 628. These imports were spread over the land. There are few stations that did not receive sugar and tobacco. English piece goods were consigned to 20 Stations, Ajmere taking 278 tons, and Jeypur 214, of which 12 tons were afterwards redistributed.
- Salt traffic.** 629. The exports were necessarily confined to fewer stations. There are but three places where salt is produced in the neighbourhood of the line, and of the 72,888 tons that were booked, 23,706 came from Sambhar, 25,627 from the Bhartpur districts, and 20,993 tons from the Farukhnagar works. 3,816 tons were sent in the first instance to Rewári to be subsequently re-booked. As in the previous year, Farukhnagar salt was almost entirely booked through to Bareilly, Chandausi and other places of Rohilkhand. But the Bhartpur salt and that which came from Sambhar, was simply booked to Agra where it was delivered to the consignees, and re-distributed from their warehouses by river and cart and rail. Agra received in all 43,033 tons of salt, while 21,905 tons passed through the Delhi Station.
- Cotton traffic.** 630. Cotton is more widely spread. There is but little grown on the land bordering the line between Delhi and Alwar; but south of this from Mandáwar to Ajmere there were but two stations that did not send away some bales. Jeypur in 1875 despatched 1,578 tons, Sangáner 811 tons, Dosa 1,656 tons, Bási 651 tons and Ajmere 1,378 tons.
- Screws established for pressing cotton.** 631. Most of this cotton was sent in loose bales and consigned to Agra, where it was sampled and sold for subsequent despatch by the E. I. Railway and the river Jumna, either screwed for export or loose for local weaving. Late in the year, however, screws were established, especially at and near Ajmere. In the six months ending 31st March 1876, out of 110,746 maunds sent by rail (of which 51,165 maunds were consigned from Ajmere and Nasirabad) 47,287 maunds were full screwed.
- Presses for lightly pressing cotton not popular.** 632. Squeezing presses to enable traders to send lightly pressed cotton at a cheaper rate than that charged for loose cotton were established in the railway compounds at Dosa Jeypur and Ajmere, but they were not popular, and very little squeezed cotton was carried.

## LOCOMOTIVE DEPARTMENT.

## STATE.

633. During the year Mr. S. Sayer arrived from England, and was appointed Locomotive Superintendent. Mr. C. H. Davies also joined the Railway Staff as Assistant Superintendent.

Locomotive Department.

634. The total rolling stock on the line at the close of the year is shown in a table attached to this report (Appendix L). The additions during the year were 9 locomotives, 28 coaching and 114 goods vehicles, while 3 locomotives were transferred to another State Railway. At the close of the year there were 62 locomotives and 995 vehicles of different kinds on the railway.

Rolling stock.

635. On an average each engine at work hauled trains the following number of miles :—

Average number of miles each engine hauled trains.

A. Class tank engines	..	17,176
B. „ Bogie „ 4 coupled	..	15,303
C. „ „ „ 6 „	..	8,942
D. „ tender engines 4 wheeled	..	11,876
E. „ „ 6 „ 4 coupled	..	18,876

636. The work done in this respect is limited by the moderate speed allowed, and by the badness of the water on the line which makes it necessary to wash out the locomotives after each trip of 90 or 100 miles, instead of turning them round quickly.

Work limited owing to badness of water.

637. The vehicles ran in all 12,283,153 miles. Of the two kinds of vehicle that form the bulk of the rolling stock, the 3rd class carriages ran 37,953 miles each, and the covered goods wagons 12,262 miles each.

Vehicle mileage.

638. Rs. 43,585 were expended from Revenue in maintaining and repairing locomotives, and Rs. 18,427 on vehicle stock.

Cost of repairs of engines & vehicles.

639. The maintenance of the locomotives in good order was found to be a difficult matter from many causes. First and foremost, the qualifications and characters of the Engine-men whose services could be obtained were not always such as they should be. The traffic having developed rapidly, many Engine-men and others were required, but the field of supply in India is limited. It was not thought advisable to apply to Government for the engagement of more hands from England, for at times there are qualified men in India, who are out of employment, but the alternative course of depending on this local supply has its dangers. With such men there is always fear of intemperance, and the evil is so wide-spread that it needed firm repression to make head against it.

Causes which rendered the maintenance of locomotives in good order difficult.

## STATE.

Causes which rendered the maintenance of locomotives in good order difficult.

Secondly, the Workshop arrangements were only temporary, and wanting in the conveniences necessary for the maintenance of a considerable number of locomotives.

Thirdly, the water on the line is very bad at many of the stations. As far as present experience goes, it seems that in the hot weather, when the water in the wells falls low, deposits are formed in the boilers, and at this time of the year the small bored injectors are liable to get plugged up. When the rains fall and the well-water is sweet the incrustations are dissolved and the boiler being cleaned out, leaky tubes show themselves, although no trouble is experienced with the injectors.

Fourthly, the locomotives on the line were of 6 different types, and the parts not being interchangeable, a slight defect would often throw one out of running until specially repaired.

640. At the beginning of the year, failures in running Engines were not unfrequent, but towards the close much improvement had been effected.

## Use of coal.

641. Coal was used as the fuel of all the locomotives. In the year 1875, 8,396 tons were burned, being an average consumption of 254 lbs. per 1,000 ton miles. This consumption includes all loss of fuel in stores and in movement from the collieries to the depôts.

642. Much difficulty was experienced in obtaining coal. The only sources of supply that were open were the Rániganj fields which yield an inferior steam coal, and that portion of the Karharbálí fields which was worked by the Bengal Coal Company and the Karharbálí Coal Association. In order to economise consumption, attempts were made to rely solely on the last two firms, but the experiment failed, and large purchases of Rániganj coal had at times to be made to keep up supplies. Towards the end of the financial year, an advantageous arrangement was made with the E. I. Railway Company for the supply of their surplus rubble coal, and by this all source of anxiety in respect to fuel has now been removed and considerable economy may be looked for. Experiments as to the values of different kinds of coal were set on foot, but not carried out up to the close of the year.

Engine drivers all Europeans; firemen natives.

643. The engine-men were almost without exception Europeans, and no native craftsmen have been found who were fit to be trusted with running engines. The narrow gauge engines require in some respects even more skill than those of the broad gauge. Their compactness makes it more difficult to examine them, and the smallness of their parts demands great care and cleanliness to prevent failures. Firemen, however, were chiefly natives.



644. Of 323 men employed at one period of the year in this Department,—

STATE.  
State of education of  
Locomotive Staff.

216	were illiterate.
7	could read Urdu.
7	„ Nāgri.
2	„ Mundi.
1	„ Kaithi.
1	„ Gurmukhi.
89	„ English.

Although foreign to the subject in hand, it is perhaps worth while, as an indication of the state of education amongst the class of natives employed on railways to analyze these figures a little more closely. Of the 89 who could speak English, all except 15 were foreigners, that is, they had come from Great Britain, France, or some other foreign country. This leaves 249 natives of India as being in employment in various ways, and of these only 33, or about one in eight, could read. Fifteen of the 33 were employed as clerks, because they could read English, but the little learning of the remaining 18 brought them no profit in the shape of daily wages.

645. Those who could read some vernacular language were thus employed—

Natives having a  
knowledge of the  
vernacular how  
employed.

6	Shunters and head Firemen, Pay Rs. 20 to 50.
1	Khalási „ 5 to 7.
2	Carriage Inspectors „ 8 to 10.
6	Fitters and 3 other craftsmen „ 10 to 25.

646. Among the illiterate were all the peons, running-room servants, watermen, sweepers, chāukídārs, greasers, cleaners, coalmen, smiths and trollymen, with 49 out of 50 khalásís.

647. The state of education among the staff of the Traffic Department has already been noticed ; and for the sake of comparison it may here be noted, that when similar enquiries were made respecting the Engineer's Department, it was found that out of 95 mates, or headmen of gangs of laborers :—

State of education of  
Engineering Staff.

60	could not read.
1	could read English.
26	„ Nāgri.
3	„ Bengali.
4	„ Hindi.
1	„ Kaithi.

These men get about Rs. 8 to Rs. 15 each.

Out of 161 gatemen, 108 could not read.

10	could read Urdu.
26	„ Nāgri.
16	„ Hindi.
1	„ Kaithi.

These men get Rs. 5 each a month.

## STATE.

Natives exclusively  
employed in loco-  
motive shops.

648. In the locomotive shops, which, pending the erection of the complete shops at Ajmere, are merely temporary work-sheds with a few heavy tools and machines, natives were employed almost exclusively. In a few years it will be practicable to start classes of apprentices, in which amongst others the sons of railway employées might get systematic training, but at present this is not feasible. What is being done is to gather together and train native workmen as a nucleus of the future shop establishment; for good native locomotive fitters are not to be found without difficulty, and the maintenance of some sixty engines and a thousand vehicles with such imperfect appliances has been a difficult task.

## AUDIT AND ACCOUNTS DEPARTMENT.

Audit and accounts.

649. This branch of the railway service remained in charge of Mr. R. B. Duncan, Examiner of Accounts, who was assisted first by Mr. Morrison and afterwards by Mr. J. Douglas.

650. The whole business of this branch of the administration was conducted smoothly and with no difficulties that need be here recorded.

Pay and Cash offices.

651. The Pay and Cash offices were, pending the organization of a separate department, in charge of the Examiner of Accounts. The Executive Engineers still remained disbursing officers, but the business of this branch of the service increased largely.

Cash collections.

652. The cash collections of the line are paid into the Treasury at Agra, but in order to avoid needless movement of currency, a system of cashing the cheques of local disbursing officers at the principal stations was adopted. There was no difficulty worth mentioning from the receipt of bad coin.

Cashier of Locomo-  
tive Department.

653. The Cashier of the Locomotive Department was during the year transferred to the Pay Office, and the Locomotive Superintendent ceased to be a disbursing officer. Heads of Departments now only hold small imprests for contingent expenses.

Press and Stationery  
office.

654. The charge of the Press and the Stationery office, which was organized and placed on a definite footing during the year, also remained under the supervision of the Examiner of Accounts.

## STORES DEPARTMENT.

Stores.

655. Mr. Hiley was the Store-keeper in charge of the stores for the greater part of the year, relieving Mr. C. Thompson.

**STATE.**

656. The completion of the store godown at Agra Cantonment enabled the stores which had hitherto been lying on the left bank of the Jumna to be concentrated, and the stores taken over from the contractors to be properly arranged. The store accounts with the contractors were not entirely closed, but the adjustments were nearly completed during the year.

Agra Cantonment  
store godown.

657. The depôt at Delhi was largely reduced, and a beginning was made of the concentration of heavy stores such as permanent-way at Bandikui Junction.

Delhi Store Depôt.

658. There was at one time delay in complying with the demands of departments for stores, but this was put right as the business was reduced to order, and, considering the difficulties that had to be contended with, the administration was satisfactory.

Administration of  
Stores Department  
satisfactory.

659. Arrangements were made for a methodical verification of stores under the Audit Office, but the work was not carried out during the year, and is now to be done.

Verification of stores.

**MEDICAL DEPARTMENT.**

660. The Medical arrangements of the line were under the consideration of the Government during the year. Proposals had been made for their organization, but orders have not been received, and a proper system has yet to be introduced. There is an urgent need of hospitals and dispensaries, but the preparation of a scheme for these waits on the decision as to the system of Medical supervision that is to be adopted.

Medical.

**POLICE.**

661. Major Law returned from furlough and resumed charge of the Office of Superintendent of Police, which had been held in his absence by Mr. White, and for a short time by Mr. Bower.

Police.

662. There were some small troubles at the commencement of the year from the bickerings of the subordinate members of the Police and Traffic Departments who could believe no good thing of each other, but these have to a great extent disappeared, and the railway owes much to Major Law's administration of his force.

Troubles experienced  
at first starting.

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**STATE.****Strength of force.**

663. During the year, after considerable negotiation, the strength of the regular police was fixed at—

- 1 Inspector.
- 6 Sub-Inspectors.
- 19 Head Constables.
- 96 Constables.
- 1 European Sergeant.

At the close of the year, arrangements were almost complete for organizing the Chaukidárs, who had hitherto kept watch and ward over property as a regular force under the Police Superintendent.

664. The success of the police force in detecting and preventing crime need not here be touched upon, as it properly belongs to another branch of administration.

**Appropriation and outlay accounts.**

665. The appropriation and outlay accounts, and the other tables prescribed in Circular No. 25 R. dated 25th May 1875, are attached to this report.

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# APPENDIX A.

[ Imperial. ]

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, IMPERIAL, FOR THE YEAR 1875-76.

### Section A.

SERVICE HEADS.								Grant as per Budget Orders.	Final grant at end of year.	Outlay.
ORIGINAL WORKS.								Rs.	Rs.	Rs.
Military	...	...	...	...	...	...	...	1,12,500	1,38,700	1,85,464
Civil Buildings	...	...	...	...	...	...	...	87,000	1,11,000	93,172
								1,49,500	2,49,700	2,78,636
REPAIRS.										
Military	...	...	...	...	...	...	...	78,500	72,300	60,184
Civil Buildings	...	...	...	...	...	...	...	13,000	18,000	14,964
Communications	..	...	...	...	...	...	...	...	8,000	8,000
								91,500	98,300	83,148
Establishment	...	...	...	...	...	...	...	60,750	59,250	68,817
Tools and Plant	...	...	...	...	...	...	...	...	...	...
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Increase to Stock	...	...	...	...	...	...	...	...	...	...
"    to London Invoices	...	...	...	...	...	...	...	...	...	...
"    to London Stores	...	...	...	...	...	...	...	...	...	...
Net additional grant sanctioned during the year	...	...	...	...	...	...	...	1,00,500	...	...
Total								4,02,250	4,02,250	4,30,601
Less—Expenditure in England								...	...	...
Net outlay in India								4,02,250	4,02,250	4,30,601
SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE.										
New supplies	...	...	...	...	...	...	...	7,000	7,000	2,495
Repairs	...	...	...	...	...	...	...			1,129
Establishment	...	...	...	...	...	...	...			862
Profit and Loss	...	...	...	...	...	...	...			...
								7,000	7,000	3,986
Less—Expenditure in England								...	...	...
"    Reduction in grant	...	...	...	...	...	...	...	...	...	...
Net outlay in India								7,000	7,000	3,986
GRAND TOTAL								4,09,250	4,09,250	4,34,587
Expenditure on Imperial Works from funds supplied in addition to Budget-Grants.								Amount of contribution.		Outlay.
.....Nil.....										

# APPENDIX A.

Imperial.—PART I—concluded.

ACCOUNT OF APPROPRIATIONS FROM IMPERIAL FUNDS DURING THE YEAR 1875-76, ARRANGED BY HEADS OF SERVICE.

## Section B.

SERVICE HEADS.								Grant as per Budget Orders.	Final grant at end of year.	Outlay.
MILITARY.								Rs	Rs	Rs
Original Works	...	...	...	...	...	...	...	1,12,500	1,38,700	1,85,464
Repairs	...	...	...	...	...	...	...	78,500	72,300	60,184
Establishment	...	...	...	...	...	...	...	47,750	47,750	61,412
Tools and Plant	...	...	...	...	...	...	...	...	...	...
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Net additional grant sanctioned during the year	...	...	...	...	...	...	...	20,000	...	...
								2,58,750	2,58,750	3,07,060
OTHER SERVICES.										
Civil Buildings.										
Original Works	...	...	...	...	...	...	...	37,000	1,11,000	93,172
Repairs	...	...	...	...	...	...	...	13,000	13,000	14,964
Establishment	...	...	...	...	...	...	...	13,000	11,500	7,405
Tools and Plant	...	...	...	...	...	...	...	...	...	...
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Increase to Stock	...	...	...	...	...	...	...	...	...	...
„ to London Invoices	...	...	...	...	...	...	...	...	...	...
„ to London Stores	...	...	...	...	...	...	...	...	...	...
Net additional grant sanctioned during the year	...	...	...	...	...	...	...	72,500	...	...
								1,35,500	1,35,500	1,15,541
COMMUNICATIONS.										
Repairs	...	...	...	...	...	...	...	...	8,000	8,000
Net additional grant sanctioned during the year	...	...	...	...	...	...	...	8,000	...	...
								8,000	8,000	8,000
GRAND TOTAL								4,02,250	4,02,250	4,30,601
Less—Expenditure in England	...	...	...	...	...	...	...	...	...	...
Net outlay in India								...	...	4,30,601
SUPPLY AND REPAIR OF BARRACK AND HOSPITAL FURNITURE.										
New supplies	...	...	...	...	...	...	...	7,000	7,000	2,495
Repairs	...	...	...	...	...	...	...			1,129
Establishment	...	...	...	...	...	...	...			362
Profit and Loss	...	...	...	...	...	...	...			...
Less—Expenditure in England	...	...	...	...	...	...	...	...	...	...
„ Reduction in grant	...	...	...	...	...	...	...	...	...	...
Net outlay in India								...	...	3,986
TOTAL ORDINARY EXPENDITURE								4,09,250	4,09,250	4,34,587

# APPENDIX A.

## Imperial.—PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANTS TO ACCOMPANY THE ANNUAL APPROPRIATION ACCOUNTS, IMPERIAL, FOR THE YEAR 1875-76.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>		
<b>ORIGINAL WORKS.</b>		
	<b>Rs.</b>	
Purchase of the Observatory Estate at Simla	20,000	Govt. of India's No. 224 A dated 20th July 1875 ; Local Government's No. 3589 dated 6th September 1875.
Purchase of four houses on the Peterhoff Estate at Simla ... ..	60,000	Govt. of India's No. 361 M. & C. dated 27th October 1875 ; Local Government's No. 4529 dated 5th November 1875.
River Protective Works at Dera Ismail Khan ... ..	15,000	Govt. of India's No. 793 dated December 1875 ; Local Government's No. 5296 dated 20th December 1875.
Closing openings in the barracks at Kohat to afford protection from cold in the winter months ... ..	5,000	Govt. of India's No. 140 A-G dated 8th February 1876 ; Local Government's No. 791 dated 21st February 1876.
<b>REPAIRS.</b>		
Maintenance of the Steamer "Chenab" ...	8,000	Punjab Govt.'s (Civil Dept.) No. 1410 dated 24th July 1875 ; Local Government's No. 509 C dated 10th August 1875, and No. 3657 dated 15th September 1875.
	1,08,000	
<b>REDUCTIONS.</b>		
<b>ORIGINAL WORKS.</b>		
Reduction of grant from Budget Item No. 24, Telegraph Office at Umballa ... ..	6,000	Govt. of India's No. 363 M. & C. dated 27th October 1875 ; Local Government's No. 4546 dated 6th November 1875.
<b>ESTABLISHMENT.</b>		
Reduction of grant from Establishment ...	1,500	Ditto ditto ditto.
	7,500	
Net additions ... ..	1,00,500	

D. H. TRAIL, Major, R. E.,  
Examiner Public Works Accounts, Punjab.

# APPENDIX B.

[ Provincial. ]

## PART I.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, PROVINCIAL, FOR THE YEAR 1875-76.

### Section A.

SERVICE HEADS.							Grant as per Budget Orders.	Final grant at end of year.	Outlay.
ORIGINAL WORKS.							Rs-	Rs-	Rs-
Civil Buildings	...	...	...	...	...	...	2,49,000	8,95,000	8,20,948
Communications	...	...	...	...	...	...	74,000	1,78,200	1,67,841
Miscellaneous Public Improvements	...	...	...	...	...	...	5,000	1,100	8,256
							3,28,000	5,69,300	4,91,540
REPAIRS.									
Civil Buildings	...	...	...	...	...	...	1,59,000	2,17,907	2,01,117
Communications	...	...	...	...	...	...	5,87,000	6,04,800	6,04,800
Miscellaneous Public Improvements	...	...	...	...	...	...	7,000	10,598	6,527
							7,53,000	8,32,800	8,11,944
Establishment	...	...	...	...	...	...	4,40,050	5,02,890	5,00,491
Tools and Plant	...	...	...	...	...	...	25,000	18,800	-2,435
Profit and Loss	...	...	...	...	...	...	...	...	536
Additional grant sanctioned during the year	...	...	...	...	...	...	8,77,740	...	...
							8,42,790	5,21,690	4,98,592
Add increase to Stock	...	...	...	...	...	...	...	...	57,869
„ balances of Suspense Account chargeable to Grant	...	...	...	...	...	...	...	...	...
Stock Purchases and Sales	...	...	...	...	...	...	...	...	110
Miscellaneous Advances	...	...	...	...	...	...	...	...	16,897
Total							19,28,790	19,28,790	18,76,452
GRANT-IN-AID TO GENERAL LOCAL FUND.									
ORIGINAL WORKS.									
Civil Buildings	...	...	...	...	...	...	...	10,000	9,808
Communications	...	...	...	...	...	...	...	9,500	7,221
Miscellaneous Public Improvements	...	...	...	...	...	...	...	2,600	1,655
							...	22,100	18,684
REPAIRS.									
Civil Buildings	...	...	...	...	...	...	...	...	...
Communications	...	...	...	...	...	...	...	2,500	2,500
Miscellaneous Public Improvements	...	...	...	...	...	...	...	5,000	5,152
							...	7,500	7,652
Additional grant sanctioned during the year	...	...	...	...	...	...	29,600	...	...
TOTAL GRANT-IN-AID							29,600	29,600	26,336
GRAND TOTAL							19,58,390	19,58,390	19,02,788
Expenditure on Provincial Works from funds supplied in addition to Budget-Grant.								Amount of contribution and grant-in-aid.	Outlay.
CONTRIBUTION.								Rs-	Rs-
Original Works, Civil Buildings	...	...	...	...	...	...	...	9,322	8,300
GRANT-IN-AID FROM GENERAL LOCAL FUND.									
Original Works, Communications	...	...	...	...	...	...	...	2,500	3,113
Repairs, Communications	...	...	...	...	...	...	...	1,88,600	1,86,568
Establishments	...	...	...	...	...	...	...	76,200	79,775
TOTAL GRANT-IN-AID							...	2,67,300	2,69,456



# APPENDIX B.

Provincial.—PART I—concluded.

ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS, PROVINCIAL, FOR 1875-76,  
ARRANGED BY HEADS OF SERVICE.

## Section B.

SERVICE HEADS.							Grant as per Budget Orders.	Final grant at end of year.	Outlay.
							Rs.	Rs.	Rs.
Civil Buildings	...	...	...	{	Original Works	...	2,49,000	8,95,000	8,20,943
							1,59,000	2,17,907	2,01,117
							4,08,000	6,12,907	5,22,060
Communications	...	...	...	{	Original Works	...	74,000	1,73,200	1,67,341
							5,87,000	6,04,300	6,04,300
							6,61,000	7,77,500	7,71,641
Miscellaneous Public Improvements	...	...	...	{	Original Works	...	5,000	1,100	8,256
							7,000	10,593	6,527
							12,000	11,693	9,783
Establishment	...	...	...	...	...	...	4,40,050	5,02,890	5,00,491
Tools and Plant	...	...	...	...	...	...	25,000	18,800	— 2,435
Profit and Loss	...	...	...	...	...	...	...	...	536
							4,65,050	5,21,690	4,98,592
Additional grant sanctioned during the year	...	...	...	...	...	...	8,77,740	...	...
Add increase to Stock	...	...	...	...	...	...	...	...	57,869
Add balance of Suspense Account chargeable to Grant	...	...	...	...	...	...	...	...	...
Stock Purchases and Sales	...	...	...	...	...	...	...	...	110
Miscellaneous Advances	...	...	...	...	...	...	...	...	16,897
Total	...	...	...	...	...	...	19,28,790	19,28,790	18,76,452
GRANT-IN-AID TO GENERAL LOCAL FUND.									
Civil Buildings	...	...	...	{	Original Works	...	...	10,000	9,808
							...	...	...
							...	10,000	9,808
Communications	...	...	...	{	Original Works	...	...	9,500	7,221
							...	2,500	2,500
							...	12,000	9,721
Miscellaneous Public Improvements	...	...	...	{	Original Works	...	...	2,600	1,655
							...	5,000	5,152
							...	7,600	6,807
Additional grant sanctioned during the year	...	...	...	...	...	...	29,600	...	...
Total Grant-in-aid	...	...	...	...	...	...	29,600	29,600	26,836
GRAND TOTAL	...	...	...	...	...	...	19,58,390	19,58,390	19,02,788

# APPENDIX B.

## PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANT TO ACCOMPANY THE ANNUAL APPROPRIATION AND OUTLAY ACCOUNT, PROVINCIAL, FOR THE YEAR 1875-76.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>		
Additional grant sanctioned by Civil Department	Re- 8,65,800	Local Government's No. 2374 dated 18th June 1875, and No. 2524 dated 25th June 1875.
Ditto ditto ...	80,700	Local Government's No. 4406 C dated 30th October 1875.
Ditto ditto ...	21,000	Local Government's No. 897 dated 25th February 1876.
<b>TOTAL ADDITIONS</b> ...	<b>4,17,500</b>	
<b>REDUCTIONS.</b>		
Transferred to Civil Department to meet pay of the Assistant Secretary Local Funds Branch and a portion of his Office Establishment.	10,160	Local Government's No. 1229 dated 26th June 1875.
<b>NET ADDITION</b> ...	<b>4,07,340*</b>	Provincial Fund proper ... 3,77,740 Grant-in-aid to Genl. Local Fund 29,600 <b>4,07,340</b>

D. H. TRAIL, Major, R. E.,  
Examiner Public Works Accounts, Punjab.

# APPENDIX C.

## [ General Local Fund. ]

### PART I.

#### ACCOUNT OF APPROPRIATION FOR PUBLIC WORKS (GENERAL LOCAL FUND) FOR THE YEAR 1875-76.

##### Section A.

SERVICE HEADS.								Grant as per Budget Orders.	Final grant at end of year.	Outlay.
ORIGINAL WORKS.								Rs.	Rs.	Rs.
Civil Buildings	...	...	...	...	...	...	...	40,000	69,200	62,081
Communications	...	...	...	...	...	...	...	36,000	1,26,895	1,05,188
Miscellaneous Public Improvements	...	...	...	...	...	...	...	1,21,810	78,610	74,776
								1,97,810	2,74,705	2,41,995
REPAIRS.										
Civil Buildings	...	...	...	...	...	...	...	4,000	5,430	5,353
Communications	...	...	...	...	...	...	...	2,16,000	2,45,435	2,38,199
Miscellaneous Public Improvements	...	...	...	...	...	...	...	73,000	78,140	78,140
								2,93,000	3,24,005	3,11,692
Establishment	...	...	...	...	...	...	...	2,00,000	2,00,000	2,00,000
Tools and Plant	...	...	...	...	...	...	...	...	...	...
Profit and Loss	...	...	...	...	...	...	...	...	...	...
Net Additional Grant sanctioned during the year	...	...	...	...	...	...	...	1,05,400	...	...
								7,95,710	7,95,710	7,53,687
GRANT-IN-AID TO PROVINCIAL FUNDS.										
ORIGINAL WORKS.										
Communications	...	...	...	...	...	...	...	...	2,500	3,113
								...	2,500	3,113
REPAIRS.										
Communications	...	...	...	...	...	...	...	1,84,000	1,88,600	1,86,568
								1,84,000	1,88,600	1,86,568
Establishment	...	...	...	...	...	...	...	76,200	76,200	79,775
Net Additional Grant sanctioned during the year	...	...	...	...	...	...	...	7,100	...	...
TOTAL GRANT-IN-AID								2,67,300	2,67,300	2,69,456
TOTAL GENERAL LOCAL FUND								10,63,010	10,63,010	10,23,143
Expenditure on General Local Fund Works from funds supplied in addition to Budget-Grant.								Amount of Contribution.		Outlay.
ORIGINAL WORKS.								Rs.	Rs.	
Communications	...	...	...	...	...	...	...	18,805	15,522	
								18,805	15,522	
REPAIRS.										
Communications	...	...	...	...	...	...	...	100	100	
Miscellaneous Public Improvements	...	...	...	...	...	...	...	185	185	
								285	285	
								19,090	15,807	
GRANT-IN-AID FROM PROVINCIAL FUND.										
ORIGINAL WORKS.										
Civil Buildings	...	...	...	...	...	...	...	10,000	9,808	
Communications	...	...	...	...	...	...	...	9,500	7,221	
Miscellaneous Public Improvements	...	...	...	...	...	...	...	2,600	1,655	
REPAIRS.										
Communications	...	...	...	...	...	...	...	2,500	2,500	
Miscellaneous Public Improvements	...	...	...	...	...	...	...	5,000	5,152	
TOTAL GRANT-IN-AID								29,600	26,336	

## APPENDIX C.

### General Local Fund—PART I—concluded.

ACCOUNT OF APPROPRIATION FROM GENERAL LOCAL FUND DURING 1875-76,

ARRANGED BY HEADS OF SERVICE.

#### Section B.

SERVICE HEADS.						Grant as per Budget Orders.	Final grant at end of year.	Outlay.
						Rs.	Rs.	Rs.
Civil Buildings	...	...	{	Original Works	...	40,000	69,200	62,031
				Repairs	...	4,000	5,430	5,353
Communications	...	...	{	Original Works	...	36,000	1,23,895	1,05,188
				Repairs	...	2,16,000	2,45,435	2,33,199
Miscellaneous Public Improvements	...		{	Original Works	...	1,21,810	78,610	74,776
				Repairs	...	73,000	73,140	73,140
Establishment	...	...	...	...	...	2,00,000	2,00,000	2,00,000
Tools and Plant	...	...	...	...	...	...	...	...
Profit and Loss	...	...	...	...	...	...	...	...
Net additional grant sanctioned during the year						1,05,400	...	...
						7,95,710	7,95,710	7,53,687
GRANT-IN-AID TO PROVINCIAL FUND.								
Civil Buildings	...	...	{	Original Works	...	...	...	...
				Repairs	...	...	...	...
Communications	...	...	{	Original Works	...	...	2,500	3,113
				Repairs	...	1,84,000	1,88,600	1,86,568
Miscellaneous Public Improvements	...		{	Original Works	...	...	...	...
				Repairs	...	...	...	...
Establishment	...	...	...	...	...	76,200	76,200	79,775
Tools and Plant	...	...	...	...	...	...	...	...
Net additional grant sanctioned during the year						7,100	...	...
TOTAL GRANT-IN-AID						2,67,300	2,67,300	2,69,456
TOTAL GENERAL LOCAL FUND						10,63,010	10,63,010	10,23,143

## PART II.

DETAIL OF ADDITIONAL GRANTS AND REDUCTIONS IN GRANTS TO ACCOMPANY THE ANNUAL  
APPROPRIATION AND OUTLAY ACCOUNTS, GENERAL LOCAL FUND,  
FOR THE YEAR 1875-76.

PARTICULARS.	Amount.	REFERENCES.
<b>ADDITIONS.</b>		
Additional grants by Civil Department	Rs. 80,800	Local Govt.'s No. 2374 dated 18th June 1875 " " 2524 " 25th " " " " 4406 C " 30th Oct. " " " 897 " 25th Feb. 1876.
	33,400	
	9,300	
	39,000	
	1,12,500	
<b>REDUCTIONS.</b>		
Nil.		
NET ADDITION	1,12,500	* General Local Fund proper Rs. 1,05,400 Do. grant-in-aid to Provincial " 7,100 1,12,500

D. H. TRAIL, Major, R. E.,  
Examiner Public Works Accounts, Punjab.

# APPENDIX D.

[ Irrigation. ]

## PART I.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS FOR THE YEAR 1875-76.

*Extraordinary and Ordinary.*

SERVICE HEADS.						Grant as per Budget Orders.	Final grant at end of year.	Outlay.
CAPITAL.						Rs.	Rs.	Rs.
EXTRAORDINARY.								
Works	...	...	...	...	...	21,69,080	20,91,456	18,54,328
Establishment	...	...	...	...	...	6,30,920	5,78,644	4,37,304
Plant	...	...	...	...	...	1,50,000	2,79,900	3,12,475
Suspense Balances	...	...	...	...	...	...	...	2,09,561
Total					...	29,50,000	29,50,000	23,13,668
Less—Receipts on Capital Account					...	...	...	10,193
Net Outlay					...	29,50,000	29,50,000	23,03,475
Less—Expenditure in England					...	...	...	...
Net Expenditure in India					...	29,50,000	29,50,000	23,03,475
ORDINARY.								
Works	...	...	...	...	...	53,012	1,27,230	1,22,353
Establishment	...	...	...	...	...	1,32,166	1,06,711	1,46,374
Plant	...	...	...	...	...	3,000	3,000	18,841
Profit and Loss	...	...	...	...	...	...	...	...
Suspense Balances	...	...	...	...	...	...	...	76,472
Total					...	1,88,178	2,36,941	3,64,040
Less—Receipts on Capital Account					...	...	...	80
Net Outlay					...	1,88,178	2,36,941	3,63,960
Less—Expenditure in England					...	...	...	250
Additional grant					...	48,763	...	...
Net Expenditure in India					...	2,36,941	2,36,941	3,63,710
TOTAL CAPITAL (IMPERIAL)					...	31,86,941	31,86,941	26,67,185
REVENUE.								
Works	...	...	...	...	...	36,552	28,124	14,859
Maintenance and Repairs	...	...	...	...	...	4,01,600	6,00,048	5,38,934
Establishment	...	...	...	...	...	6,90,470	6,43,243	6,76,910
Tools and Plant	...	...	...	...	...	17,600	26,044	15,552
Profit and Loss	...	...	...	...	...	...	...	...
Total					...	11,46,222	12,97,459	12,46,255
Less—Expenditure in England					...	3,000	3,000	...
Additional grant					...	1,51,237	...	...
Net Expenditure in India					...	12,94,459	12,94,459	12,46,255
TOTAL CAPITAL AND REVENUE (IMPERIAL)					...	44,81,400	44,81,400	39,13,440

# APPENDIX D.

## PART I—concluded.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS FOR THE YEAR 1875-76.

SERVICE HEADS.						Grant as per Budget Orders.	Final grant at end of year.	Outlay.
CONTRIBUTIONS.								
CAPITAL.						Rs	Rs	Rs
Works	...	...	...	...	...	4,58,540	4,58,540	4,44,293
Establishment	...	...	...	...	...	2,74,960	2,74,960	1,86,250
Plant	...	...	...	...	...	71,500	71,500	1,42,728
Suspense Balances	...	...	...	...	...	...	...	1,31,254
Total						8,00,000	8,00,000	9,04,525
Less—Receipts on Capital Account						...	...	4,946
Net Expenditure in India						8,00,000	8,00,000	8,99,579
REVENUE.								
Works	...	...	...	...	...	...	62,194	24,912
Maintenance and Repairs	...	...	...	...	...	...	8,920	1,424
Establishment	...	...	...	...	...	...	...	...
Tools and Plant	...	...	...	...	...	...	...	...
Profit and Loss	...	...	...	...	...	...	...	...
Net Expenditure in India						...	71,114	26,336
Less—Expenditure in England						...	...	...
Additional grant						71,114	...	...
Net Expenditure in India						71,114	71,114	26,836
TOTAL CONTRIBUTIONS						8,71,114	8,71,114	9,25,915
GRAND TOTAL						58,52,514	58,52,514	48,39,353

D. H. TRAIL, Major, R. E.,  
Examiner Public Works Accounts, Punjab.

# APPENDIX D.

## PART II.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS FOR THE YEAR 1875-76.

#### *Distribution of Extraordinary and Ordinary Outlay.*

	New Works.	Main-tenance.	Estab-lishment.	Tools and Plant.	Profit and Loss.	Suspense Balances.	Total.	Less Receipts on Capital Account.	Net Expendi-ture of the year.	Less Expendi-ture in England.	Net Outlay in India.	Grant as per Budget Orders.	Final Grant at end of year.
	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs
<b>IMPERIAL.</b>													
<b>CAPITAL.</b>													
<i>Extraordinary.</i>													
Western Jumna Canal	2,12,344	...	1,22,806	20,346	...	1,37,504	4,93,000	1,164	4,91,836	...	4,91,836	7,81,600	7,81,600
Bári Doáb Canal	3,22,992	...	93,511	16,984	...	-1,06,061	3,28,426	1,330	3,27,096	...	3,27,096	5,00,000	5,00,000
Sirhind Canal	8,18,992	...	2,20,987	2,75,145	...	1,77,255	14,92,379	7,699	14,84,680	...	14,84,680	16,68,400	16,68,400
Special Survey Lower Bári Doáb Canal	...	...	...	...	...	-137	-137	...	-137	...	-137	...	...
<b>TOTAL A.</b>	13,54,328	...	4,37,304	3,12,475	...	2,09,561	28,13,668	10,193	28,03,475	...	28,03,475	29,50,000	29,50,000
<i>Ordinary.</i>													
Western Jumna Canal	1,247	...	385	...	...	22,720	24,302	...	24,302	...	24,302	...	...
Bári Doáb Canal	7,079	...	1,790	...	...	51,524	60,398	...	60,398	...	60,398	8,015	8,335
Lower Sutlej and Chenab Inundation Canals	...	...	...	...	...	347	347	...	347	...	347	...	...
Upper Sutlej Inundation Canals	17,903	...	4,524	...	...	350	22,777	...	22,777	...	22,777	20,512	29,262
Indus Inundation Canals	90,444	...	16,316	...	...	-179	1,06,581	...	1,06,581	...	1,06,581	24,315	1,06,484
Special Survey Derajat Canals	1,453	...	56,108	-404	...	1,350	58,502	18	58,484	...	58,484	74,450	38,604
Ditto Lower Bári Doáb Canal	3,397	...	67,806	528	...	360	71,591	62	71,529	...	71,529	60,886	54,306
Mádhopur Workshops	...	...	...	18,717	...	...	18,717	...	18,717	250	18,467	...	...
Sirhind Canal	880	...	...	...	...	...	880	...	880	...	880	...	...
Additional Grant	...	...	...	...	...	...	...	...	...	...	...	48,763	...
<b>TOTAL B.</b>	1,22,353	...	1,46,374	18,841	...	76,472	3,64,040	80	3,63,960	250	3,63,710	2,36,941	2,36,941
<b>TOTAL CAPITAL, A. + B.</b>	14,76,681	...	5,83,678	3,31,316	...	2,86,033	26,77,708	10,278	26,67,435	250	26,67,185	31,86,941	31,86,941

# APPENDIX D.

## PART II.—concluded.

### APPROPRIATION ACCOUNT OF IRRIGATION WORKS FOR THE YEAR 1875-76.

#### Distribution of Extraordinary and Ordinary Outlay.

	New Works.	Main-tenance.	Estab-lishment.	Tools and Plant.	Profit and Loss.	Suspense Balances.	Total.	Less Receipts on Capital Account.	Net Expenditure the year.	Less Expenditure in England.	Net Outlay in India.	Grant as per Budget Orders.	Final Grant at end of year.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
REVENUE.													
Western Jumna Canal	521	1,22,259	2,47,038	5,340	...	...	3,75,158	...	3,75,158	...	3,75,158	3,87,010	3,94,796
Delhi and Gurgón Irrigation Works	...	3,619	8,973	-12	...	...	12,580	...	12,580	...	12,580	16,080	12,540
Bári Doab Canal	8,886	2,15,908	2,50,886	5,309	...	...	4,80,939	...	4,80,939	...	4,80,939	3,48,890	4,87,731
Lower Sutlej and Chenab Inundation Canals	5	7,889	39,199	730	...	...	47,823	...	47,823	...	47,823	55,470	49,787
Upper Sutlej Inundation Canals	...	65,488	47,042	536	...	...	1,13,066	...	1,13,066	...	1,13,066	1,11,645	1,11,742
Indus Inundation Canals	5,447	1,17,714	65,119	1,738	...	...	1,90,013	...	1,90,013	...	1,90,013	1,80,838	2,09,450
Shahpur Canals	...	4,448	766	...	...	...	5,214	...	5,214	...	5,214	4,880	4,880
Madhopur Workshops	...	1,609	17,937	1,916	...	...	21,462	...	21,462	...	21,462	28,845	26,280
Reserve	...	...	...	...	...	...	...	...	...	...	...	12,564	253
Additional Grant	...	...	...	...	...	...	...	...	...	...	...	1,51,237	...
Less Expenditure in England	...	...	...	...	...	...	...	...	...	...	...	-3,000	-3,000
<b>TOTAL</b>	<b>14,859</b>	<b>5,38,934</b>	<b>6,76,910</b>	<b>15,552</b>	<b>...</b>	<b>...</b>	<b>12,46,255</b>	<b>...</b>	<b>12,46,255</b>	<b>...</b>	<b>12,46,255</b>	<b>12,94,459</b>	<b>12,94,459</b>
<b>TOTAL IMPERIAL, A. + B. + C.</b>	<b>14,91,540</b>	<b>5,38,934</b>	<b>12,60,588</b>	<b>3,46,868</b>	<b>...</b>	<b>2,86,033</b>	<b>39,23,963</b>	<b>10,273,391</b>	<b>39,13,690</b>	<b>250</b>	<b>39,13,440</b>	<b>44,81,400</b>	<b>44,81,400</b>
CONTRIBUTIONS.													
Capital.													
Śirhind Canal	4,44,293	...	1,86,250	1,42,728	...	1,31,254	9,04,525	4,946	8,99,579	...	8,99,579	8,00,000	8,00,000
<b>TOTAL</b>	<b>4,44,293</b>	<b>...</b>	<b>1,86,250</b>	<b>1,42,728</b>	<b>...</b>	<b>1,31,254</b>	<b>9,04,525</b>	<b>4,946</b>	<b>8,99,579</b>	<b>...</b>	<b>8,99,579</b>	<b>8,00,000</b>	<b>8,00,000</b>
REVENUE.													
Lower Sutlej and Chenab Inundation Canals	24,912	1,424	...	...	...	...	26,336	...	26,336	...	26,336	71,114	71,114
Additional Grant	...	...	...	...	...	...	...	...	...	...	...	...	...
<b>Total</b>	<b>24,912</b>	<b>1,424</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>26,336</b>	<b>...</b>	<b>26,336</b>	<b>...</b>	<b>26,336</b>	<b>71,114</b>	<b>71,114</b>
<b>TOTAL CONTRIBUTIONS</b>	<b>4,69,205</b>	<b>1,424</b>	<b>1,86,250</b>	<b>1,42,728</b>	<b>...</b>	<b>1,31,254</b>	<b>9,30,861</b>	<b>4,946</b>	<b>9,25,915</b>	<b>...</b>	<b>9,25,915</b>	<b>8,71,114</b>	<b>8,71,114</b>
<b>GRAND TOTAL</b>	<b>19,60,745</b>	<b>5,40,358</b>	<b>14,26,838</b>	<b>4,89,596</b>	<b>...</b>	<b>4,17,287</b>	<b>48,54,824</b>	<b>15,219,483</b>	<b>39,605</b>	<b>250</b>	<b>48,39,855</b>	<b>53,52,514</b>	<b>53,52,514</b>

D. H. TRAIL, Major, R. E.,  
Examiner Public Works Accounts, Punjab.



# APPENDIX E.

[Guaranteed Railways.]

STATEMENT SHOWING THE PROGRESS MADE IN CONSTRUCTION OF RAILWAYS IN THE PUNJAB, AND THE STATE OF THEIR WORKING  
FROM 1ST APRIL 1875 TO 31ST MARCH 1876.

Name of Railway.	PASSENGERS DURING THE YEAR.					Receipts from passengers.		Receipts from merchandise and miscellaneous.		Total receipts.		Working expenses.		Net profit.		No. of European and Eurasian Staff.	No. of Native Staff.	Total Capital expended from commencement.	
	Mileage open during the year.	Total mileage open.	1st Class.	2nd Class.	Intermediate Class.	3rd Class.	Total.	Rs.	A. P.	Rs.	A. P.	Rs.	A. P.	Rs.	A. P.			Rs Per Indian Boote.	A. P.
Punjab and Delhi Section	...	558	16,525½	41,040½	17,231	2,106,105	2,180,902	28,41,169	0 10 22,72,984 13 11	46,14,103 14	9 28,50,072 4	3 17,64,031 10 6	372	8,242	6,80,44,483 11 1				
Scinde Section	...	110	1,767½	3,196	4,540½	95,454½	104,958½	1,27,663	0 6 11,07,781 14	7 12,35,444 15 1	8 8,60,486 14 8	3 74,958 0 5	220	2,357	2,00,08,926 10 4				
Indus Steam Flotilla ...	...	...	242	223	...	9,940½	10,405½	74,580	10 11 10,46,281 9	0 11,20,862 3 11	4 8,10,481 4 5	5 8,10,380 15 6			46,99,380 10 9				
Total ...	...	668	18,535	44,459½	21,771½	2,211,500	2,296,266	25,48,412 12	3 44,26,998 5	6 69,70,411 1	7 945,21,040 7	5 424,49,370 10 5	592	10,599	9,27,52,741 0 2				

# APPENDIX F.

[ Indus Valley (State) Railway. ]

STATEMENT SHOWING PROGRESS MADE IN WELL SINKING AT THE SUTLEJ BRIDGE DURING  
THE 1875-76 (*vide* PARA. 493 OF REPORT).

Foundations.	Wells.	DEPTHS ATTAINED.			Remarks on the Wells.	Remarks on the Foundations.
		1874-75.	1875-76.	Total		
A	1	24.31	51.23	75.54	{ In abeyance till completion of H, I & K. Hearted. Do.	{ The wells are all 18' 9" in diameter, and have 5 feet thickness of steining.
	2	38.15	61.85	100.00		
	3	22.70	77.30	100.00		
B	4	34.40	65.60	100.00	{ Do. Do. Do.	{ B superstructure commenced.
	5	56.27	43.73	100.00		
	6	31.14	68.86	100.00		
C	7	55.79	44.21	100.00	{ Do. Do. Do.	{ C connecting block of masonry about to be commenced.
	8	23.85	76.15	100.00		
	9	34.95	65.05	100.00		
D	10		75.44	75.44	{ The wells of D, E, F and G have met only with sand or light silt. The outer wells of each foundation are in advance of the centre wells.	{ There is good reason to expect that all the wells of these four foundations, D to G, will reach their full depth before the floods of this season.
	11		52.10	52.10		
	12		69.40	69.40		
E	13		78.09	78.09		
	14		57.54	57.54		
	15		80.05	80.05		
F	16		69.50	69.50		
	17		63.41	63.41		
	18		68.13	68.13		
G	19		73.39	73.39		
	20		60.17	60.17		
	21		78.38	78.38		
H	22		62.16	62.16	{ The wells of H, I and K met with clay at a depth of 30 feet. The up-stream well of each foundation has penetrated the stratum.	{ The whole of the wells of these three foundations will reach a depth of 75 feet before the floods of this season.
	23		30.69	30.69		
	24		36.52	36.52		
I	25		61.96	61.96		
	26		28.86	28.86		
	27		40.81	40.81		
K	28		65.39	65.39		
	29		38.46	38.46		
	30		43.25	43.25		

Foundations L, M, N, O. Wells 31 to 42 inclusive not commenced.

P	43	29.84	38.89	68.73	{ The 9 wells of P, Q and R, commenced last season, met with a clay stratum at 30 feet; they have been driven through it with difficulty, and are now progressing well.	{ The 9 wells will all be sunk to their full depth before the floods of this season; the two of Q, which are down, have reached a bed of very hard blue clay.
	44	25.91	41.50	67.41		
	45	32.06	30.57	62.63		
Q	46	29.36	70.64	100.00		
	47	26.65	47.01	73.66		
	48	29.60	70.40	100.00		
R	49	23.32	43.48	66.80		
	50	32.58	29.45	62.03		
	51	22.81	42.91	65.72		
	573.69	2,202.53	2,776.22			

ABSTRACT.

Lineal feet sunk to		
end of 1874-75 ...	573.69	
Do. do. 1875-76 ...	2,202.53	
Total lin. ft. to date ...	2,776.22	
Brick-work to end of		
1874-75, cub. feet ...	220,817.35	
Do. do. 1875-76, c.ft....	537,935.45	
Total brick-work up		
to date, cubic feet ...	758,752.80	

## APPENDIX G.

[ Indus Valley (State) Railway. ]

STATEMENT SHOWING PROGRESS MADE IN THE RETI DIVISION IN THE CONSTRUCTION OF  
MAJOR BRIDGES.

Distin- guishing No. of Bridge.	Mileage.	Description.	Present condition.
7	175.0	16 spans, 10 ft. A.	Excavation just commenced.
10	176.0	" "	Untouched.
13	177.0	10 " 40 ft.	About quarter of the well masonry built. Both abutment wells sunk full depth ; other two pairs half sunk.
19	182.0	12 " 10 ft. A.	The inverts are being turned.
46	188.0	25 " "	Half the arches turned.
47	189.0	25 " "	Finished.
63	204.0	6 " 40 ft.	Well masonry complete ; sinking very nearly finished. North abutment and two piers built.
69	211.0	10 " 40 ft.	Half the well masonry complete ; four pairs of wells half sunk.
70	212.0	10 " 10 ft. A.	Complete to springing.
71	212.0	1 " 40 "	Foundation blocks just completed.
76	214.0	5 " 40 ft.	Curbs being pitched.
78	214.0	9 " "	Well masonry complete. Abutments and three piers built ; one more pair of wells sunk ; the other four pairs half sunk.
79	215.0	18 " "	Abutments and two piers built ; another pair of wells sunk ; all the other wells are nearly down to their full depth.
84	216.0	10 " 10 ft. A.	Finished.
86	217.0	1 " 40 ft.	One pair of wells sunk ; the other wells three-quarters sunk.
91	219.0	2 " "	Half the well masonry built ; sinking just begun.
93	219.0	3 " "	Well masonry complete. This bridge and No. 91 have wells only 25 feet deep on account of the stiff clay soil met with

## APPENDIX H.

[ Indus Valley (State) Railway. ]

STATEMENT SHOWING PROGRESS MADE IN THE GHOTKI DIVISION IN THE CONSTRUCTION OF  
MAJOR BRIDGES (*vide* PARA. 517 OF REPORT).

NUMBERING.		Mileage.		Dimensions.	Present condition.
General estimate.	Progress section.	M.	F.		
0	2	222	7	1 span, 40 ft.	First length of steining 15 feet completed for four wells; two spans of six metre originally proposed.
6	3	224	0	12 spans, 40 ft.	The well-sinking almost completed and superstructure commenced.
7	4	224	2	11 " "	Second length of steining built on all wells, and some are sunk 35 feet below ground.
8	5	224	6	3 " "	Finished.
10	6	225	1	8 " "	Sinking of all the wells in hand, 8 have 30 feet of steining built, and nearly all these have been sunk 20 feet; the other wells have 20 feet of steining built, and an average of 15 feet sunk.
11	7	225	4	5 " "	All the first lengths of steining built and being sunk.
12	8	226	1	8 " "	First length of steining being built.
13	9	226	4	8 " "	Not commenced.
14	10	227	0	15 " "	First length of steining built, and about three-quarters sunk.
15	11	227	4	10 " "	Not commenced.
16	12	228	2	8 " "	Do.
17	13	228	6	10 " "	Do.
18	14	229	4	10 " "	Do.
19	15	230	0	10 " "	First length of steining sunk, and part of second in some wells; in the others the second steining being built.
20	16	230	3	2 " "	Not commenced.
22	18	231	3	3 " "	Do.
23	19	232	0	2 " "	Do.
24	20	232	6	3 " "	First length of steining being built.
25	21	233	6	5 " "	Do. do.
26	22	234	2	8 " "	Do. do.
27	23	234	6	2 " "	Not commenced.
28	24	235	4	3 " "	Do.
48	33	243	7	10 " "	Do.
49	34	244	3	2 " "	Do.
51	35	245	0	10 " "	Do.
53	36	245	5	5 " "	Do.
101	66	261	4	10 spans, 10 ft. A.	Foundations excavated and material at site.
102	67	261	7	" "	Do. do. do.
104	69	262	7	3 spans, 40 ft.	Curbs pitched, originally 10 spans, 10-foot arches.
105	70	263	3	2 " "	Do. 5 do.
106	71	263	5	10 spans, 10 ft. A.	Curbs pitched.
107	72	264	0	5 spans, 40 ft.	Wells sunk to an average depth of 30 feet.
110	75	265	6	3 " "	Do. do. 26 "
112	77	267	0	5 " "	Do. do. 37 "
119	84	268	7	10 spans, 10 ft. A.	Blocks, drop walls and concrete half inch.
127	92	271	0	8 spans, 20 ft. A.	Finished.

## APPENDIX I.

STATEMENT SHOWING PROGRESS MADE IN THE LARKANA DIVISION IN THE CONSTRUCTION OF  
MAJOR BRIDGES (*vide* PARA. 526 OF REPORT).

Distin- guishing No. of Bridge.	Mileage.	Description.	Present condition.
31	289	25 spans, 40 ft.	Curbs being pitched and brick-work commenced.
49	298	3 " "	First length of all wells being sunk,
50	300	2 " "	Well curbs pitched.
51	301	3 " "	Do. do.
52	302	5 " "	All wells sunk, average 15 feet.
55	305	5 " "	Well curbs pitched.
56		2 " "	Not commenced.
134		1 " "	Do.
164		3 " "	Do.

# APPENDIX J.

[ Indus Valley (State) Railway. ]

TABULAR ABSTRACT SHOWING QUANTITIES OF PRINCIPAL WORKS DONE DURING 1875-76 (*vide* PARA. 479 OF REPORT).

DIVISION.			Embankments and cuttings.	Foundation cylinders, lineal feet sunk.		Concrete and brick and stone masonry.	Ballast material collected.	Permanent-way laid and ready for traffic.	Bricks for building, soorkhee, and other purposes.
				18 feet 9 inches diameter, sunk 100 feet.	9 feet diameter, sunk 30 to 40 feet.				
Shujabad	..	..	43.25	.....	.....	0.86	.....	46½	.....
Sutlej Bridge	..	..	12	2,200	340	5.78	.....	.....	60
Bahawalpur	..	..	58	.....	.....	1.35	4.3	.....	5
Khanpur	..	..	.....	.....	.....	.....	8	.....	18
Redi ..	..	..	101	.....	4,400	9.58	.....	.....	135
Ghotki ..	..	..	551.25	.....	4,000	3.00	6	.....	190
Indus Bridge	..	..	.....	.....	.....	.....	.....	.....	.....
Larkana	..	..	213	.....	260	0.72	.....	.....	70
Mehur ..	..	..	98	.....	.....	0.06	3	.....	.....
Sehwan ..	..	..	343	.....	.....	2.76	.....	.....	40
Kotri ..	..	..	50.5	.....	.....	6.81	9	48	.....
Totals	..	..	1470.0	2,200	9,000	30.92	30.3	94½	518

## STATEMENT OF TRAFFIC FOR THE YEAR 1875.

**MILEAGE RESULT FOR THE YEAR 1875.**

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# APPENDIX L.

[Rajputana (State) Railway.]

STATEMENT OF LOCOMOTIVE AND ROLLING-STOCK ON 31ST MARCH 1876.

LOCOMOTIVES.										VEHICLES.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
Bogie Engines.				Tender Engines.			COACHING STOCK.							Goods Wagons.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
4 coupled (Dubs & Co.)				4 coupled (Sharp, Stewart & Co.)			4 coupled (Sharp, Stewart & Co.)			First Class Carriages.				Composite Carriages.			Second Class Carriages.		Third Class Carriages.		Brake-vans.		Covered goods.		High-sided.		Low-sided wood under-frame.		Low-sided iron under-frame.		Ballast.		Horse-boxes.		Carriage Trucks.		Timber Trucks.		Powder-vans.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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# APPENDIX M.

[ Rajputana (State) Railway. ]

APPROXIMATE OUTLAY ON CONSTRUCTION TO END OF 1875-76.

Major and Minor Heads of Account.	Estimated Amount.	Previously Expended to 31st March 1875.	Expended during year 1875-76.	Total Expenditure to end of 1875-76.
	Rs-	Rs-	Rs-	Rs-
I. PRELIMINARY EXPENSES ... ..	2,67,560	2,56,890	27	2,56,917
II. LAND ... ..	8,96,560	8,73,404	11,778	8,85,182
III. CONSTRUCTION OF LINE—				
1. Earth-work, &c. ... ..	10,64,281	8,79,391	41,966	9,21,357
2. Bridge-work,				
i. Minor Bridges, Culverts and Flood openings ... ..	7,18,338	5,82,317	1,86,728	7,19,045
ii. Large Bridges ... ..	86,62,193	80,57,995	5,63,878	86,21,873
3. Tunnels ... ..				
4. Level Crossings, &c., &c. ... ..	1,77,339	1,18,386	40,543	1,58,934
5. Fencing ... ..	1,78,677	89,257	81,215	1,30,452
IV. BALLAST AND PERMANENT-WAY—				
1. Ballasting ... ..	1,02,67,119	7,76,967	96,195	8,73,163
2. Permanent-Way ... ..		71,84,711	12,86,454	84,21,165
V. STATIONS AND BUILDINGS—				
1. Stations and Offices ... ..	8,85,760	6,19,587	2,74,839	8,94,426
2. Workshops, Store Buildings, &c. ... ..	2,65,368	1,17,062	96,559	2,18,621
3. Staff Quarters ... ..	5,44,694	2,79,516	1,70,602	4,50,118
4. Station Machinery ... ..	6,18,510	3,76,208	1,50,847	5,27,053
VI. ELECTRIC TELEGRAPH ... ..				
VII. PLANT—				
1. Engineering ... ..	2,12,313	98,072	21,468	1,19,540
2. Locomotive ... ..		54,537	20,226	74,763
3. Carriage and Wagon ... ..		33,757	4,486	38,243
4. Station and Office Furniture ... ..		53,321	21,286	74,607
5. Traffic ... ..				
VIII. ROLLING STOCK—				
Locomotive Stock ... ..	35,18,230	8,75,287	18,181	8,57,106
2. Carriage and Wagon Stock ... ..		10,96,772	3,33,471	14,30,243
IX. MAINTENANCE ... ..	25,609	453	165	618
X. ESTABLISHMENT—				
1. Direction ... ..	16,89,876	2,87,262	21,273	3,08,535
2. Engineering ... ..		9,16,458	1,05,431	10,21,889
3. Locomotive ... ..		24,859	...	24,859
4. Telegraph ... ..		367	...	367
5. Stores ... ..		1,18,192	9,621	1,27,813
6. Audit and Accounts ... ..		75,575	16,163	91,738
7. Medical and Sanitation ... ..		28,300	3,913	32,213
8. Preliminary Expenses ... ..		2,52,977	...	2,52,977
9. Traffic ... ..		5,253	...	5,253
XI. CONTINGENCIES ... ..	...	95,189	9,730	1,04,919
WORKS DITTO ... ..	1,42,516	...	...	...
TOTAL FINAL HEADS ... ..	2,46,24,941	1,86,83,229	84,50,648	2,21,33,877
SUSPENSE ACCOUNTS ... ..	...	25,58,046	2,58,596	22,99,450
TOTAL ... ..	...	2,12,41,275	81,92,063	2,44,33,327
Deduct—RECEIPTS ON CAPITAL ACCOUNT ... ..	...	19,722	536	20,258
TOTAL ... ..	...	2,12,21,553	81,91,526	2,44,13,079
Deduct—CREDITS TO EXPENDITURE IN ENGLAND ... ..	...	65,56,793	9,91,526	75,48,319
BALANCE EXPENDITURE IN INDIA ... ..	...	1,46,64,760	22,00,000	1,68,64,760



# APPENDIX N.

[ Rajputana (State) Railway. ]

APPROXIMATE APPROPRIATION ACCOUNT FOR THE YEAR 1875-76.

MAIN HEADS OF EXPENDITURE.	Grant as per Budget Orders.	Outlay.	DIFFERENCE.	
			Saving.	Excess.
	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses ... ..	500	27	473	...
Land ... ..	87,900	11,778	76,122	...
Construction of Line ... ..	6,13,000	8,14,335	...	2,01,335
Ballast and Permanent-way ... ..	18,32,800	13,82,649	...	49,849
Stations and Buildings ... ..	6,16,000	6,92,847	...	76,847
Maintenance ... ..	...	165	...	165
Plant ... ..	10,000	67,416	...	57,416
Rolling-stock ... ..	3,00,000	3,15,290	...	15,290
<b>Total</b> ... ..	<b>29,60,200</b>	<b>32,84,507</b>		
Establishment ... ..	84,000	1,56,421	...	72,421
Contingencies ... ..	...	9,720	...	9,720
<b>GRAND TOTAL</b> ... ..	<b>30,44,200</b>	<b>34,50,648</b>		
Additional Grant ... ..	9,20,000	...	9,20,000	
Decrease to Balance of Suspense Accounts ...	9,44,200	2,58,596	...	6,85,604
	30,20,000	31,92,052	9,96,595	11,68,647
<i>Deduct</i> —Receipts on Capital Account ... ..		526		
„ Expenditure in England—stores—Rs 9,91,526		31,91,526		
Ditto Miscellaneous ... ..		9,91,526		
<b>Total Expenditure in India</b> ...		<b>22,00,000</b>		

## MODIFICATIONS OF GRANT.

SERVICE HEADS.	Grant as per Budget Orders.	Additions.	Reduc- tions.	Final Grant.	REFERENCE.
	Rs.	Rs.	Rs.	Rs.	
Preliminary Expenses ... ..	500	...	...	500	
Land ... ..	87,900	57,900	...	30,000	
Construction of Line ... ..	6,13,000	3,87,000	...	10,00,000	
Ballast and Permanent-way ... ..	18,32,800	2,12,200	...	15,45,000	* Director of Stat-
Stations and Buildings ... ..	6,16,000	1,92,000	...	8,08,000	Railways' No. 0138A
Plant ... ..	10,000	50,000	...	60,000	dated 31st January
Rolling-stock ... ..	3,00,000	4,65,000	...	7,65,000	1876, to Manager, and
Establishment ... ..	84,000	41,000	...	1,25,000	Manager's No. 1157
Contingencies ... ..	...	10,000	...	10,000	dated 7th March 1876
Suspense Accounts ... ..	9,44,200	3,79,300	...	13,23,500	to Examiner, advise reser-
<b>Total</b> ... ..	<b>21,00,000</b>	<b>* 9,20,000</b>	...	<b>30,20,000</b>	pectively—
					Indian Rs 3,50,000
					English „ 5,70,000
					<b>Rs 9,20,000</b>









